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REPORT

OF THE

DEPARTMENT OF MINES,

NOVA SCOTIA,

For the Year ending 30th September 1904.



HALIFAX, N. S.

COMMISSIONER OF PUBLIC WORKS AND MINES, KING'S PRINTER,
1905.

T. C. ALLEN & CO., PRINTERS, 124 & 126 GRANVILLE ST.

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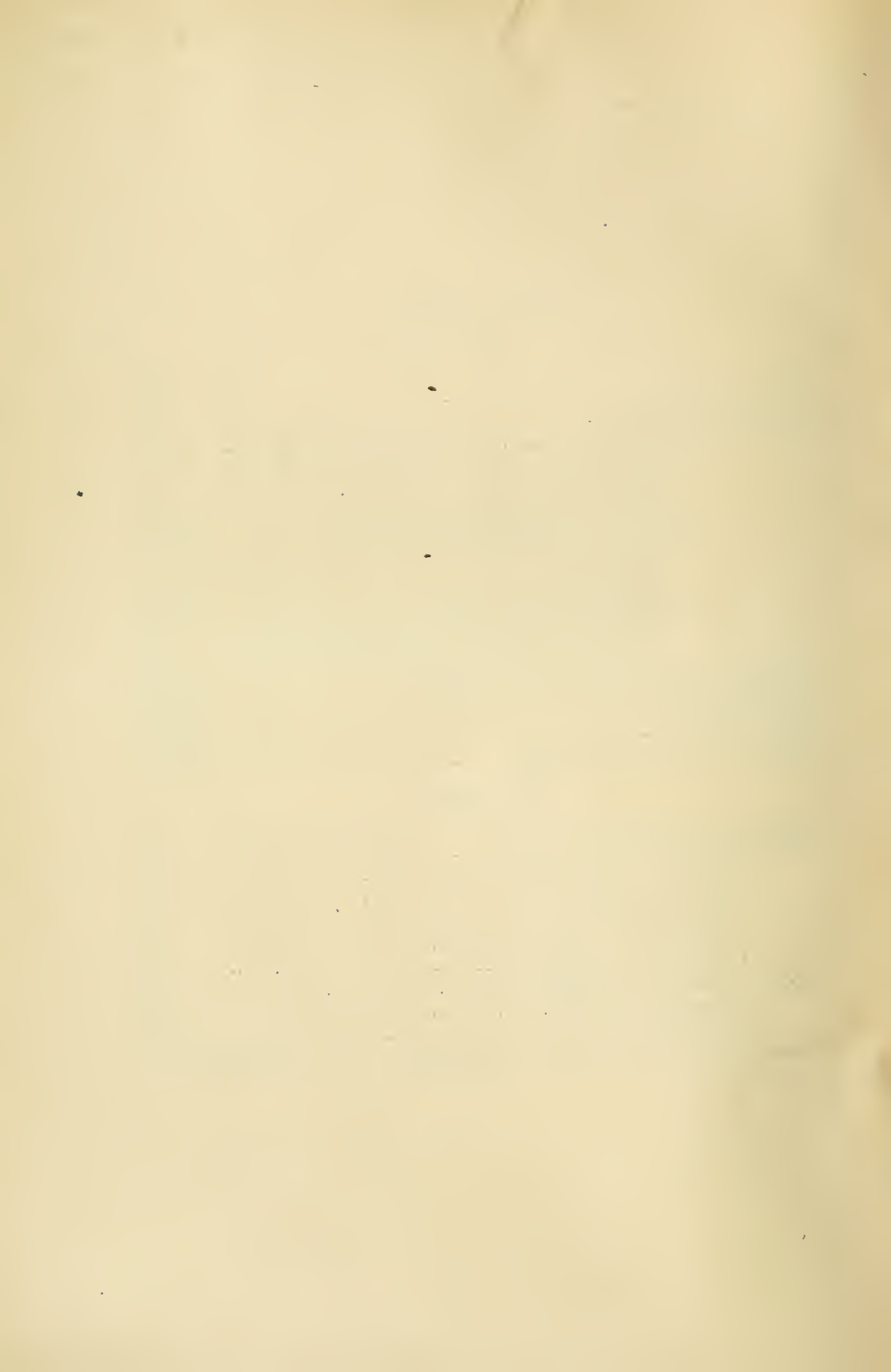
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DEPARTMENT OF MINES.

REPORT FOR THE YEAR ENDED SEPTEMBER 30, 1904.

To His Honour THE HONOURABLE ALFRED GILPIN JONES,
Member of the King's Privy Council for Canada,
Lieutenant-Governor of Nova Scotia, &c., &c.

MAY IT PLEASE YOUR HONOUR,—

I respectfully present herewith to Your Honour the Annual Report of the Inspector of Mines, containing an account of the progress of mining operations, together with statistical information compiled by him from official and other returns.

I am,

Your Honour's obedient servant,

A. DRYSDALE,
Commissioner of Public Works and Mines.

HALIFAX, December 10th, 1904.

REPORT

ON THE

MINES OF NOVA SCOTIA.

By EDWIN GILPIN, JR., A.M., LL.D., DCL.,

COMPANION IMPERIAL SERVICE ORDER, FELLOW OF THE ROYAL SOCIETY OF CANADA, ETC., ETC.

OFFICE OF INSPECTOR OF MINES,

HALIFAX, December 9th, 1904.

TO THE HONOURABLE A. DRYSDALE, M.P.P., M.E.C.,

Commissioner of Public Works and Mines:—

SIR,—I beg leave to submit the following report on the Mines of Nova Scotia.

The following summary shows, so far as I have been able to learn, the Mineral production of Nova Scotia for the year ended September 30th, 1904, compared with that for the year ending September 30th, 1903.

	Year ended Sept. 30, 1903.	Year ended Sept. 30, 1904.
Gold.....Oz.	25,198	14,279
Iron Ore*.....Tons	415,192	258,338
Manganese Ore*....."	.....	.....
Coal raised†....."	5,245,247	5,247,135
Coke made†††....."	392,600	235,158
‡Gypsum†††....."	175,850	181,166
Grindstones, etc.†....."	650	800
Limestone†....."	262,544	191,356
Barytes†††....."	897	1,100
Moulding Sand†....."	240	175

* Imported ore.

†Ton of 2,240 lbs.

††† Net tons.

‡ Amount exported.

Not including returns from Londonderry Mines.

Note.—Further details will be found in the tables at end of report.

*Statement Showing Amounts and Sources of Revenue Received by
Mines Department during year ended September 30th, 1904.*

	1ST. QUARTER.	2ND. QUARTER.	3RD. QUARTER.	4TH. QUARTER.	TOTAL.
Prospecting licenses, (apps)..	\$ 1738 50	1283 00	1832 00	2013 00	6866 50
Gold leases, apps.....	602 00	1003 00	798 00	1164 00	3572 00
Gold rentals.....	16 00	12 00	2466 50	9218 50	11713 00
Licenses to search, apps.....	2730 00	2940 00	3060 00	3780 00	12510 00
Leases, apps, other than Gold or Silver.....	350 00	800 00	2800 00	4300 00	8250 00
Rentals, other than Gold or Silver.....		30 00	3750 00	15450 00	19230 00
Gold royalty.....	1488 07	1342 71	504 61	1446 67	4782 06
Coal royalty.....	161825 34	149146 55	74098 91	132472 84	517543 64
	\$168749 91	\$156562 26	\$89310 02	\$169845 01	\$584467 20
Fees.....					785 71
					<u>\$585252 91</u>

Less amount refunded on each ton of coal consumed in the manufacture of Iron and Steel in Nova Scotia, as follows:—

October 10th, 1903, Dominion Iron and Steel Co., 6½ cents	\$ 7173 34
“ “ “ Nova Scotia Steel & Coal Co., 5 “	2410 70
Jany. 20th, 1904, Nova Scotia Steel & Coal Co., 5 “	1038 80
“ 25th, 1904, Dominion Iron and Steel Co., 6½ “	7162 32
March 10th, 1904, Nova Scotia Steel & Coal Co., 5 “	1456 20
April 29th, 1904, Dominion Iron and Steel Co., 6½ “	6872 74
	<u>\$26114 10</u>

During the past year Mr. Lambert Lynn was engaged in surveying coal lease areas at Cheticamp, Inverness County, and in Cumberland County in the district lying west of the Maccan River.

The usual display of our minerals was made at the Provincial Exhibition. Immediately afterwards the exhibit was removed to Glace Bay, and shown there for several days.

Mr. Piers has continued his assiduous attention to the Science Library and Museum. These two departments are rapidly becoming complete, and are frequently visited by parties desirous of informing themselves on the natural products of the Province, and of consulting the authorities who have written on the properties and manufacture of crude natural products.

The schools for Colliery Officials and Engineers were held as usual. A new system of granting engineers' certificates is being put in force.

During the past season an agreement was entered into with the Doliver Mountain Mining Company to deepen their shaft some 700 feet, to a depth of 1000 feet. Some work was done when arrangements were made to permit the company to prospect the ground in advance by a bore-hole.

The Departmental drills have been employed intermittently during the year, as will be seen by Mr. Weatherbe's report.

During the past year you considered it advisable that full particulars about the departmental drills, the terms of leasing, cost of drilling, methods, etc., should be printed, as affording the readiest and most satisfactory method of answering enquiries made by those wishing to use the drills. Mr. Weatherbe has prepared a handbook on the subject which answers all requirements. It will be found inserted in this report, and numerous copies have been distributed in separate form.

COAL TRADE.

The returns of coal sold during the year 1904, show, when compared with those of 1903, as follows:—

	1903.	1904.
Nova Scotia.....	1,605,477	1,395,593
New Brunswick.....	376,722	414,537
P. E. Island.....	78,472	80,141
Newfoundland.....	133,162	127,138
Quebec.....	1,403,916	1,730,948
West Indies.....		
United States.....	968,832	713,170
Other countries.....	54,493	83,082
Total.....	4,621,074	4,544,609

The production was 5,247,135 compared with 5,245,247 tons in 1903.

Increases are shown in the sales to New Brunswick, P. E. Island and Quebec, and decreases in the sales in Nova Scotia, and to Newfoundland and the United States.

CUMBERLAND COUNTY.

During the past year the production was 631,604 tons, compared with 593,475 tons during the year 1903.

PICTOU COUNTY—(INCLUDING COLCHESTER COUNTY)

This county produced 654,008 tons compared with 697,743 tons in 1903.

The following report by Mr. A. V. Cameron, deputy inspector, gives details of the work done at the collieries in his district.

SPRINGHILL, November 16th, 1904.

E. GILPIN, ESQ :

Deputy Commissioner and Inspector of Mines.

DEAR SIR,—I have the honor to submit to you herewith a condensed report on the various mines in the districts of Pictou, Colchester and Cumberland Counties which I hope will meet with your approval.

I have the honor to be

Your obedient servant,

A. V. CAMERON,

Deputy Inspector.

CUMBERLAND COUNTY.

JOGGINS MINES.

The output of this mine for the past year has been seriously affected by the fire which occurred on the 10th of January.

The position of this fire was on the main slope, about 70 feet above the 3100 feet levels, and necessitated flooding this lift or section of the mine. It comprised about 1200 feet of levels, and a double balance on the east side, and 1800 feet of levels and 3 balances on the west side of the slope. Of those balances only one was operated by the extracting of coal from six pillars, and No. 2 balance west was equipped to commence to drive bords. The other two balances would soon have been ready to operate. Therefor a considerable increase to the output would have been added in a month's time.

However, it required only 18 days to flood the mine and about 5 weeks to pump the water out. There had been very heavy falls of roof encountered in slope and levels, also in 1 and 2 balances west. The slopes and levels were cleaned and retimbered as far as No. 2 balance west, and to No. 1 balance east about the last of April. Then the financial condition of the company compelled them to hold the men's wages in abeyance and a strike resulted.

The strike was carried on in so forcible a manner as to stop the operation of the railway, and draw the fires from the boilers at the mines, thereby stopping the pumps, and the lower workings were in a few days under water again, as the abnormal influx of water common during the spring of the year was then accumulating. However, work was resumed and the water again pumped out, and it was found that the west side had been greatly damaged where it was cleaned up before. Now it is only cleaned up a short distance further than it was before the second flooding.

But No. 1 balance so called, the pillar balance, is cleaned up and now in operation, and the output is about equal to what it was before the fire, viz, 5,000 tons per month.

During the summer an airway was made at the 2,500 feet lift, East Side, up through the old workings to the 1300 feet levels out to the fanway. This admitted of the cleaning up of No. 3 slope workings and remedied the trouble from the damp that those workings gave off. This, in the summer months, was inclined to extend into the East Longwall workings of No. 2 slope. This change has given the best possible results.

SURFACE.

During last winter a pair of large boilers 7 feet in diameter and 30 feet long were moved from No. 3 and added to the battery at No. 2 slope, which provides ample steam power for the increasing output. A new trestle is now being built from the extreme back end of the bankhead to the stone dump. The position of the track on the bank will be changed so that 12 or 14 boxes can be hoisted on each rake from the mine. This will put the hoisting capacity in shape to compare more with modern ideas of deep mining. The mouth of the pipe slope and hoisting slope has been newly timbered.

The old shed at the mouth of the pipe slope, which was a menace to the mine in case of fire has, by my advice, been removed. Marsaut safety lamps are now used in the mine, and general indications point to a favourable winter's work.

I have made 15 visits to this mine during the year.

The average amount of ventilation passing through this mine is 20,000 cubic feet per minute.

Appended you will find a report on the investigation into the cause of the fire and results.

DR. E. GILPIN, JR.,

Deputy Commissioner of Public Works and Mines,

SIR :—In accordance with your instructions we beg leave to hand you the following summary report on the fire at Joggins Mines in Cumberland Co. :—

We have made two examinations of the workings, one on Monday, January 11th, 1904, and one on Thursday, February 11th, 1904, and after holding informal investigations the following appear to be the facts in the case :—

On Sunday, January 10th, J. Charman, who was in charge of the two pumps at the bottom level, the 3100 ft. level, so-called, and R. LeBlanc in charge of the larger pump at the 2500 ft. level, went down the slope together at 5 o'clock in the afternoon.

One Alder Ripley was relieved at the 2500 ft. level and went up to the surface, leaving Charman and LeBlanc the only two men in the mine.

They both went to the big pump and Charman with a stable lantern, left about 5.15 o'clock, for the bottom to attend to the pump there.

He spent some ten or fifteen minutes at his duties and returned up the slope about 5.30 with an open light, having procured this from a box at the pump and left his stable lantern hanging there.

This open light was of the usual "tea-pot" pattern, and on reaching a stopping about 75 feet from the bottom, Charman took the light from his hat and after getting through, he looked back to see if anything had caught. This stopping was made of wood (tongue and groove boards), and was very dry. A small opening covered with canvass was left in it to allow the boxes to be hoisted up and down the slope, and as these wore the canvass off at the ends rapidly, and left a frayed and ragged edge, a new piece longer than the others was hung on the upper side, the old pieces still being left there. After going through this door, this new canvass would thoroughly shut out any signs of fire, had there been any.

Charman rejoined LeBlanc at the pump station on the 2200 ft. level, and after remaining there for about five minutes they smelt smoke, and went out to the slope where it was thicker. Their lights went out, and with some difficulty they reached the trolley at about 800 ft. level, and on arriving at the bankhead immediately gave the alarm.

Upon investigation an hour or so later, it was found that the fire had reached a point some 100 ft. below the cross-cut marked "A" on the accompanying plan, and until Monday evening it was fought by carrying a brattice down the main slope, and stopping the pumps and allowing the surplus water from the upper lodgments to run down the slope.

A stopping was put in also at "B" in the fan slope, and the iron door in the brick stopping in the cross-cut at "A" was sealed.

About nine o'clock on Monday evening a consultation was held by the manager (Mr. Burrows), Messrs. Poole, Coleman and ourselves, and the plan was adopted of sealing off the fire area. Accordingly a stopping was put in at "D".

Some time afterwards gas was found to be escaping through the stoppings and flooding was commenced on Friday, 29th. The water reached a height within 15 feet of the cross-cut containing the brick stopping "A." The fire then being considered to be out, a Jeansville pump 4" suction and 4" discharge was borrowed from Mr. Baird at the Chignecto Mine, and was placed in the Fan slope and unwatering commenced.

On February 11th, 1904, the water had been reduced to a level 95 feet below the cross cut mentioned above, or 80 feet in 240 hours.

At 60 feet below the cross cut "A" in the main slope falls commenced in the roof, and it is probable these extended to the point of commencement of the fire.

It is further most probable that the flames were confined entirely to the slope and within a space between the brattice where it started and to the point mentioned above where the falls are first noticed.

No loss of human life occurred as a result of the accident though all the horses, (nine in number) were killed. Five of these were stationed on the 2,500 feet level.

It appears that although the pump-men carried railway lanterns, they bought these themselves, and that no specific orders were given them in this matter, nor were safety lamps served out to them.

The management say that it was *understood* by the men generally that safety lamps, or at least *closed lights*, should be carried in such cases.

We would strongly recommend that in future the Department absolutely insist on nothing but safety lamps being used in this mine, as it is known to contain inflammable gas and much material liable to fire.

We remain,

Your obedient servants,

A. V. CAMERON,

Deputy Inspector.

D'ARCY WEATHERBE, C. E.

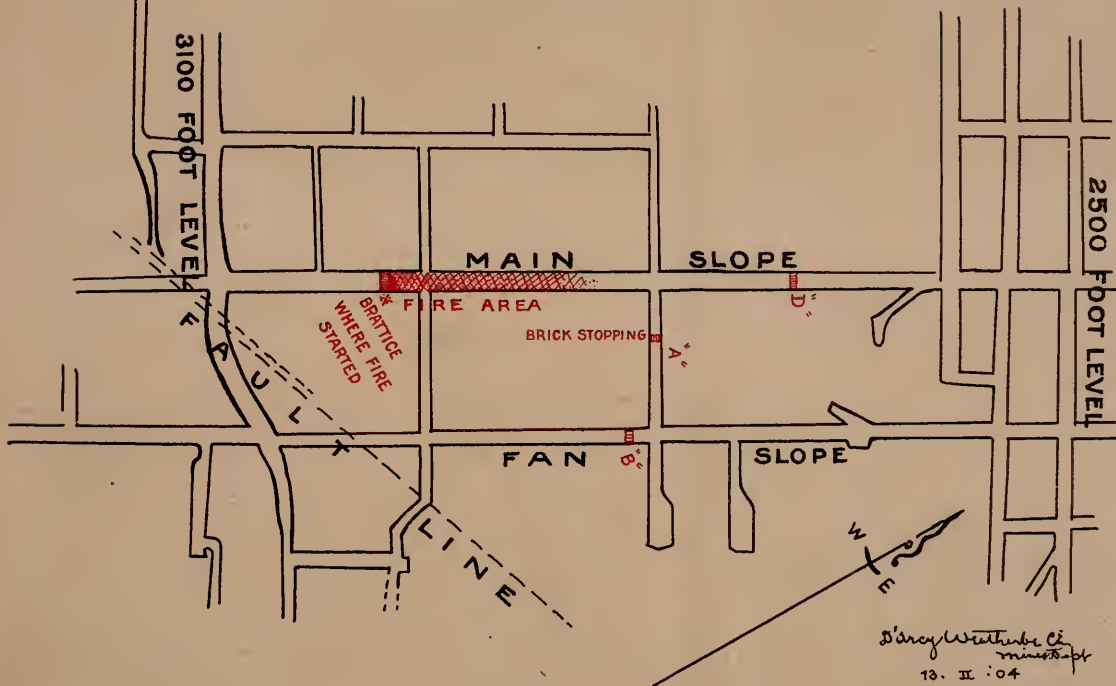
Mines Department.

PLAN OF
MINE



SCALE = 100' TO 1"

SCALE = 100' TO 1"



SPRINGHILL MINES, CUMBERLAND CO.

No. 2 SLOPE.

I mentioned in my last report that No. 1 seam was being worked through the Aberdeen fault.

This work has been continued on a small scale throughout the year.

A tunnel is now being driven east of Aberdeen sinking, on the 2,160 feet level, which will tap both bench and fall coal and open up a large area of splendid coal.

On the east side of No. 2 Slope pillar work has been continued throughout the year. Also on the west side of Aberdeen.

East Aberdeen level has been extended 884', making a total distance from No. 2 slope of 11,289 feet.

Shoots have been driven at intervals to the rise, a distance of 500 feet, and worked by board and pillar.

The Aberdeen sinking is down 1,247 feet, or a total distance from surface of 2,803 feet.

When the slopes were down 2160 feet levels were broken off east and west and balances driven to the rise.

The west levels were extended 1225 feet when they struck the Aberdeen fault.

The east levels were extended 970 feet.

A new fanway has also been driven to connect at the 400 feet levels with the present return.

No. 2 hoisting slope is now cleaned and timbered down to the 3000 feet level, and it is the intention of the management to sink 620 feet lower and then make connection with Aberdeen workings through the fault.

The lower part of this slope has been relayed with 40-lb. steel rails.

No. 3 SLOPE, SPRINGHILL.

At this slope a continuation of pillar work on the 2600 feet and 3200 feet lifts has been carried on continually during the year.

At the same time the extension of the 3800 levels has progressed fairly well.

The east level is now driven 560 feet with a tunnel 198 feet long to the lower seam and levels started off east and west.

On the west side of the 3,800 feet level the levels have been extended 1040 feet during the year, or to a total distance of 1,740 feet with connections to the rise.

Considerable repairs have been made in all directions for the health and safety of all concerned.

Giving orders for improvements and seeing that the improvements are made is the work day rule of the manager and his staff of busy officials.

To no new improvements in machinery that they can utilize do they give the go by.

At the Aberdeen slope a new Capell fan with a capacity of 150,000 cubic feet per minute has been set up. This, by a newly invented arrangement in mechanical science, can be instantly changed from a downsending supplying of fresh air to an exhaustor of any superabundance of it. This is a study for the miner's comfort and safety practically illustrated.

"SURFACE," No. 2 SLOPE.

One brick chimney 100 feet high, base 10 feet x 10 feet and top 8 feet 6 inches has been built for four 200 horse-power boilers, steam pressure, 150 lbs.

They have also put in a new screen and pricking belt at No. 3 slope.

BUILDINGS FOR WORKMEN.

2 Two storey detached dwellings, 27 feet x 40 feet.

5 Double dwellings, 24 feet x 40 feet.

1 Three storey hotel with basement, size 40 feet x 30 feet, with one wing 20 feet x 26 feet, with 22 bedrooms and 15 enameled bath tubs.

They have also added to their machinery, one new large lathe in the machine shop for turning locomotive wheels. Built by J. J. McCabe & Co., New York.

No. 2 SLOPE.

One new boiler house for new Mumford Boilers, size, 52 x 53 feet and 24 feet high.

RAILROAD.

One first-class passenger car, 55 feet long.

One combination car, 55 feet long, fitted with all modern improvements. Also one conductor's van.

FIRE SERVICE.

1000 feet of 10 inch cast iron pipe.

3000 feet of 6 inch cast iron pipe.

Also 11 fine hydrants of most improved style.

The Underwriters' fire pump, size, 16 inch x 19 inch x 12 inch, with a capacity of 750 gallons per minute, is situated between No. 2 and No. 3 slopes.

I have made 15 visits to these slopes during the year. The average amount of air is about 78,000 cubic feet per minute.

MINUDIE MINE, RIVER HEBERT.

This mine worked steadily during the year. Since my last report, improvements have been made as follows:—They have sunk the slope 200 feet, which now makes the slope 1,300 feet in length from the surface. Levels have been broken off 1,000 feet from the surface in both directions and gateways laid off. At 1,300 feet they have broken off levels which are driven in a short distance.

The levels at the 800 feet lift have been extended in both directions and gateways laid off as the levels advance.

SURFACE.

On the surface they have installed a 7 feet Stine mine fan, which gives very good results.

They have also placed in position a coal cleaning plant, and built an extension to the bankhead to cover the plant. They have also built and finished a new engine and boiler house, 40 x 35 feet. They have also placed in position a sawmill for the use of the Colliery, and they are now in a position to do a fair business.

The ventilation is good in this mine, registering on an average 28,000 cubic feet per minute. I visited this mine eleven times during the year.

STRATHCONA MINE, RIVER HEBERT.

No. 1 SLOPE ON MILNER SEAM.

This slope has worked fairly steadily during the year.

I will briefly give an account and measurements of the underground working, as it has advanced since my last report.

No. 1 level east was extended during the year 103 feet, making a total distance of 560 feet to the face. No. 2 level was extended through the fault 206 feet, total length of level being 975 feet.

No. 2 level west was extended 225 feet, total length of level being 825 feet. This level has been standing idle for a couple of months.

No. 3 level east has been extended 425 feet, total length of level being 625 feet.

No. 3 level west has been extended 80 feet through fault, total length being 236 feet.

No. 4 level east was driven 300 feet, total length of level now 490 feet. No. 4 level west has been driven 118 feet through the fault, total length to face is now 300 feet,

Between the two faults on the west side on No. 3 and 4 levels there is a block of coal estimated to contain between 8,000 or 10,000 tons, ready to be taken out for the winter's trade. This does not include the coal on the east side.

This coal as the levels extend appears to be of a very good quality, and is in great demand in the market.

It is the intention to sink this slope an additional 300 feet this winter. The present output is in the vicinity of 125 tons per day.

NO. 2 SLOPE, NEW SEAM.

The company started to sink on this seam during the summer, and they are now down a distance of 200 feet. This seam is about 3 feet 4 inches in thickness and of very good quality.

The intention is to keep on sinking to a distance of 700 feet. The first levels will be turned off shortly at 200 feet. This coal is taken by a tramway to No. 1 bankhead and shipped from there.

This new seam overlies the Milner seam about 560 feet. The output from both seams will shortly be about 200 tons per day.

The development work was delayed by the mine being flooded with water during last spring.

No. 3 and 4 levels were filled for about $2\frac{1}{2}$ months.

The boiler plant has been increased by adding one more boiler to the battery at No. 1.

I have made 12 visits to this mine during the year.

The air circulation is about 8000 cubic feet per minute.

SCOTIA COAL CO., MACCAN.

In September 1903 there was a short lift sunk and levels started off east and west and driven about 300 feet.

There are also two places working to the rise, one in the top coal which was driven for an air course. There was also a small amount of coal taken from the upper lift during the year. The coal is improving in quality as they go west.

Last September they commenced to sink another shaft, but when they were down about 50 feet they had the misfortune to have their engine house and plant burnt.

This mine is working on a very small scale, there is an average of 6 or 7 persons employed underground.

I have made 8 visits to the mine during the year. The average amount of air passing through this mine is 3,000 cubic feet per minute.

CHIGNECTO COLLIERY, MACCAN.

This mine has worked steadily during the year. The property has been taken over by the Maritime Coal Co.

In January last the output was less than 200 tons. The output has been increased and it is at the present time over 300 tons per day.

There has been a great improvement underground which has been a marked success. The levels on 1000 feet lift have been driven far enough for No. 3 balance on the east side, No. 2 balance having been completed and in running order.

The levels on the 1400 feet lifts have also been extended, and the No. 2 balance on the east to be completed, making in all 6 balances in good running order. Good roads have been built in the levels. Stables have been built and horses are now hauling the coal to the bottom.

There is very little water in the lower lift, and although the mine is so very dry, the dust which is so often seen in dry mines is not to be seen in this mine. The mine is well ventilated and every precaution is taken to guard against fire or any accidents. Hose connections have been placed at intervals of 100 feet along the water column, so that the pumps can be started and a supply of water obtained in a short time.

SURFACE IMPROVEMENTS.

They have built an extensive addition to their bankhead. They have also put in a new tippie and picking table, whereby the facilities for cleaning the coal are much improved. They have added to their plant a complete sawmill, whereby the company are enabled to cut their own lumber for all purposes. They have also erected four

tenement houses for their workmen. Everything in and around this mine reflects great credit on the management of all departments.

The ventilation in this mine is about an average of 10,000 cubic feet per minute.

I have visited this colliery eleven times during the year.

JUBILEE MINE, MACCAN.

This property was taken over by the Bay Side Coal Company, of Boston, Mass., in November, 1903.

The development work done at this mine is as follows:—They have sunk a new slope to a depth of 375 feet on No. 2 seam, known as No. 1 slope. This slope is 8 feet 6 inches wide, 6 feet 8 inches high, and timbered with 10 inch square timber, from the mouth of this slope to a depth of fifty feet. The remainder of the distance is timbered with 8 inch timber, two feet from centre to centre. The track is laid the entire depth, with 12 lb. steel T rails.

There are also turnouts on each level. The levels are laid with the same size and style of rails. There are four levels driven off, one to the eastward, and three to the westward. Those levels are 6 feet wide and 9 feet high, and are timbered with 6 inch flatted timber.

There is also an airway driven up the same distance as slope 6 feet wide and 5 feet high, which is timbered with 7 inch timber. On this slope there is a bankhead erected 47 feet long and 20 feet high, with all necessary chutes, screens and tipples, capable of handling 200 tons daily.

They have also an engine and boiler house 47 feet x 25 feet, and have installed one, 125 horse-power locomotive type boiler, and a double hoisting engine. And they have also put in a siding from the Joggins Railway main line to the bankhead, a distance of 900 feet, with two branches, one for round coal and one for slack.

On No. 3 seam they are at present sinking a slope which is down 100 feet. This is known as No. 2 slope, and timbered in good shape with 10 inch square timber. Size of slope, 8 feet 6 inches x 5 feet 8 inches.

The intention of the company is, when this slope is completed, to cross cut to the other seams and bring all the coal out through this slope. Forty-five feet west of this slope there is an airway driven out to the surface.

At present there is a temporary bankhead and a small donkey hoist at this slope, but they are building a large bankhead 80 feet long and 30 feet wide, capable of handling the output from this mine.

They have also under construction a large engine and boiler house 50 feet by 30 feet, and in addition they have erected a large boarding house and three cottages, forge, carpenter shop and stables.

I made 12 visits to this mine during the year.

The ventilation is about 3,500 cubic feet per minute.

FUNDY MINES, JOGGINS.

This mine has worked steadily during the year. The slope is down a distance of 592 ft. The levels were turned off on both sides at 500 ft. The east level is in a distance of 435 ft. The coal in this mine is worked out in chutes driven from the levels. Some of the places near the slope were worked on the double bord system, that is to say, two places going up the hill with a chute carried up alongside of each rib and a pillar left between each pair of places. Those pillars are drawn after the places are driven to the required distance. The inside places are worked on the longwall system. The chutes are broken off 30 ft. apart and are driven up 6 ft. wide for a certain distance and are then driven across to each other. This gives 36 ft. of wall for each pillar.

Levels have also been driven about 175 ft. above the 500 feet levels.

A lodgment for water has been driven, concrete dams put in, and preparations are being made for sinking another lift of 300 feet.

Very few improvements have been made on the surface. A siding has been put in to connect with the Joggins Railway road.

Some prospecting has been done on this property during the year, with the result that a new seam 3 feet thick and of good quality has been discovered, about 1,000 feet south of the seam now being operated.

I have made 12 visits to this mine during the year.

The air circulation is about 8,000 cubic feet per minute.

ACADIA MINE, WESTVILLE.

During the past year work has been continued in No. 10 and 11 lifts. The sinking was continued for 600 feet below No. 11 lift. In No. 10 all the coal is worked out on the north side. On the south side all the coal is being taken out with the exception of the level pillars from No. 5 jig out to slope. In No. 11 the levels were driven through very faulty ground, and short jigs have been driven from those levels. There were two other levels started in this lift and they are over 100 feet now and in good coal.

Nos. 6, 7 and 8 jigs are working in this lift, and they are now getting No. 5 ready.

Nothing has been done in No. 11 north since last year on account of a very large fault that had been encountered.

In No. 12 lift levels are being broken off north and south. A permanent bottom has been put in at No. 11, and the coal from that lift is hoisted from there now.

There has been a great improvement made in the airway of this mine during the year, and it shows an increased ventilation.

I have made 12 visits to this mine during the year.

The average amount of ventilation circulating is about 28,000 cubic feet per minute.

DEBERT MINE, COLCHESTER COUNTY.

COLCHESTER COAL AND RAILWAY CO., LTD.

Substantial progress has been made at this mine during the past year. Last fall the company installed a steam plant comprising a 100 H. P. Robb Mumford boiler, a 75 H. P. double drum hoisting engine, and friction gear capable of running 300 tons of coal per day from a depth of 2000 feet, and two Cameron pumps have been installed in the mine. This equipment has been working satisfactorily. New engine and boiler houses were built and also blacksmith and carpenter shops.

During the winter months three eight hour shifts were worked; and now two ten hour shifts are in operation, which the management considers more satisfactory. The sinking has gone on steadily in No. 2 slope, which is now down to a depth of 360 feet. At this depth in the seam there is a thickness of 5 feet of coal and 8 inches of fireclay.

At a depth of 245 ft. a down throw occurred in the measures, but it was not sufficient to break the continuity of the strata, and the coal seam remained intact, but at a much steeper angle.

To preserve the working angle I advised to drop the slope gradually and continue it through the rock and meet the coal again on the uprise. But the fold has proved to be more extensive than was anticipated and the slope has been dropped again on the coal, and until the sinking is completed the coal will be followed and the slopes afterwards graded.

At a depth of 180 ft. No. 2 slope was connected with No. 1 by a cross head, and 11 ft. from the face of the sinking in No. 2 slope another level has been driven far enough east to meet No. 1 slope for

purposes of ventilation, and this work is now completed. All the workings are well and heavily timbered.

During the past summer, engineer James J. Taylor, of New Glasgow, completed the instrumental survey, and plans and specifications of the proposed railway connecting the mine with the I. C. R. It is the intention of the company to commence the work of construction as soon as the development work in the mine is sufficiently advanced to get coal in sight to feed the railway.

I have made four visits to this mine during the year. The ventilation is on an average of 4000 cubic feet per minute.

ALBION MINES, PICTOU CO.

The following extensions and improvements have been made at this mine during the year.

THIRD SEAM.

There has been no work done in the east or west levels. The pillars are being extracted in No. 3 balance east side. There have been 3 balances driven up on the west side, with 9 boards in each balance.

The sinking of No. 6 lift has been completed and levels turned away, which are being worked double shift in order that the company may reach the boundary before they turn off balances. If they can attain the project in view they will be able to work out the lift retreating.

Sinking is still continued below the new levels and is down about 350 feet, and they are now on the edge of a basin that is in the McGregor pit. Their intention is to prove this basin and get to the lower point, when they will put down another borehole which will drain the whole coal field, from Albion and Allan shafts.

MCGREGOR PIT.

This part is only used as a pumping station at present, all work being abandoned until the overlying seams are taken out.

SURFACE.

The bankhead has been lengthened 12 feet, which allows the addition of one more box to a rake, and they can still add 1 more when desired.

An electric plant has been installed with the Albion as central station. The company's coal property and the Town of Stellarton are

lighted from this plant. Electric lights have been placed in the McGregor Pit Pump Room. There are no less than 20 lights in that room.

The output at the Albion has been on a steady increase during this year. The average amount of ventilation passing through this mine is about 70,000 cubic feet per minute.

I visited this Colliery 14 times during the year.

VALE COLLIERY, PICTOU COUNTY.

Since my report of 1903, operations have been continued principally in drawing stumps, as they were too small to be called pillars.

Pillars drawn in No. 4 balance crushed down on level pillars, and down on section covered with water, and caused a squeeze all over that section of the work.

Stumps were also drawn in the Gin balance, Loves balance, also in Beaton's level, and in No. 2 north, which crushed before all were drawn out, carried a balance of stumps with it and brought a sudden rush of gas from the waste in the north pillars, causing the closing up of all of this district for the time being. The gas having drained off in a short time the affected district it can again be worked at any time.

Operations since "March" have principally been carried on in the West side of main slope, which had been abandoned for a number of years. The quality of the coal in this section of the mine is better and will compare favourably with any of the other mines. Coal cutting machines have been introduced in the west section of the mines, and it looks as if their operation was going to be successful. It will, I believe, reduce the cost of coal getting in that part of the mine. There are three Ingersoll machines in use now, which will be increased to ten if their operation proves successful.

The air compressor installed is of the straight Ingersoll type, heavy cylinders 22x22, capable of producing from 900 to 1000 cubic feet of air per minute equipped with a 5 inch air pipe line from compressol to 1800 feet lift. From the 1800 feet lever the 2400 lift they are supplied by a 4 inch pipe, which is the distributing point for the power for supplying the machines.

At this point there is a large receiver with $2\frac{1}{2}$ inch and $1\frac{1}{2}$ inch pipe which is giving plenty of power for all purposes required. They have also put in a large new water column line 8 inch diameter from the 1800 feet lift to the surface, which is a great assistance to the pumps over the old line, which was only a 6 inch one.

They have also added one more boiler to their plant.

This mine is well ventilated and registers about an average of 37,000 cubic feet of air per minute.

I have made 11 visits to this mine during the year.

MARSH MINE, PICTOU CO.

Operations were carried on steadily during the year.

The slopes have been extended a distance of 629 feet, which ends the sinking of these slopes as they are now against the north anticlinal. The total length of slope from surface to basin is 2804 feet.

No. 3 levels are now driven in a distance of 1500 feet with 3 balances under operation. No. 4 levels are in 1034 feet, with 2 balances working.

There is about an average of 8,000 cubic feet of air per minute in this mine.

I have visited this mine 10 times during the year.

DRUMMOND COLLIERY, PICTOU CO.

The operations at this mine were principally on No. 14 lift.

On the north side balances were driven and the upper walls started, while on the inside Nos. 3, 4 and 5 balances were sending out coal. South of this lift No. 6 balance was put through a distance of 570 feet and started to work. Nos. 1, 2, 3, 4 and 5 balances were continually operated during the year. Levels were continued a short distance and stopped.

No. 15 Lift.—The south levels are advanced about 1100 feet and the north levels are driven 700 feet from main slope. No. 1 balance is driven 175 feet to the rise. Both No. 1 and 2 slopes were extended a short distance, and lodgements driven below lift No. 15.

Workings on No. 13 north have gone on satisfactorily, and the lift is now nearly finished. No. 6 levels have been re-opened a distance of 2200 feet, and some coal taken out both to the dip and rise.

The tunnel from Scott pit was driven to the clay vein underlying the 3rd seam. Levels were turned off and extended north 130 feet and south 30 feet. The height is 4 ft. 6 in. and is worked as an ordinary tunnel. From tests made of brick and clay in the market results are fully up to expectations.

NO. 4 SLOPE.

A pair of slants were driven 1570 feet, and connection made with No. 6 and 7 lifts. Considerable pillar work was done in this slope,

while at No. 7 a pair of levels were driven north 400 feet. The return airway from the bottom of this mine to airshaft was cleaned up and retimbered. Two lines of pipe were put down, one of 4 in. air line and a 5 in. pipe for unwatering the mine.

Besides substituting air for steam there is but a 50 feet vertical lift for water as against 500 feet by the other way.

There is now no steam in the mine below the shaft bottom, and when the compressor now being erected is completed no steam will be used underground.

A new line of 8 in. wrought iron pipe has been laid from surface to No. 9 lift in the main seam replacing the former line.

SURFACE PLANT.

“Coal Screening.”—In connection with the screening plant an Otumwa box car loader has been erected for loading box cars. In connection with this box car loader a patent swinging conveyor, made by G. F. Zimmer, London, England, has been erected. This conveyor is used also for coal picking purposes and is a compact machine.

A coal picking Belt 45 feet x 5 feet has been erected, making a total of four picking belts now in use with patent conveyor included. The picking belt building is now being covered with iron walls and roof instead of wood.

Air Compressor and Ventilating Plant.—In connection with this plant a large cross compound Corliss steam valve two stage air compressor is about erected, made by Walker Bros., Wigan, England, of the following sizes: H. P. steam $23\frac{1}{2}$ in., L. P. steam 39 in., H. P. air 22 in., L. P. air 35 in., stroke 48 in. The engine house for this machine is built of compressed red brick. The brick used was made in the company's new brick plant.

This air compressor is for supplying air for power required underground, and to replace a smaller size air compressor which has been in use for some time past. In connection with this plant a new 200 H. P. Heine water tube boiler has been erected.

Main Slope Boiler Plant.—Two 200 H. P. Heine water tube boilers have been installed.

Brick Making and Fireclay Grinding Plant.—This plant has been erected for grinding fireclay for general use in connection with the fireclay market, and also for making fire bricks, boiler tiles and red brick.

In connection with this plant, is a large grinding pan clay mixer, one large stiff plastic brick making machine. The brick drying

shed is now about completed, and is built of brick with iron floor, heated with steam and is 130 feet long by 33 feet wide. At present a small brick kiln is in use for testing purposes. The fine clay mentioned in this report is from a seam underlying the Third coal seam.

Too much praise cannot be given the manager and his staff of officials for the way they are carrying on the developments underground. The ventilation is on an average 61,000 cubic feet per minute.

I have made 12 visits to this colliery during the year.

In conclusion, I may say, that there has been considerable prospecting and boring done through Cumberland and Pictou Counties during the year, but I heard of no valuable seams being discovered. Permit me also to state that the mine managers are exercising every caution in the preservation of the valuable properties entrusted to them.

I remain,

Your obedient servant,

A. V. CAMERON,

Deputy Inspector.

Accidents during the year 1904.

No.	Date.	Mine.	Name.	Occupation.	REMARKS.
1	June 11, '04.	D. Colliery	Alex. Boyd	Driver	Leg cut while driving.
2	" 4, "	"	Daniel Hughes	Wharfman.	Two ribs broken and bruised about the face.
3	Feb. 3, "	Chignecto.....	Alex. Liddle	Bottomer ..	Injured Jan. 25th fatally, being caught between box and coal crib.
4	Nov. 26, '03.	Acadia Mine	Hugh Dunbar.....		Struck on head by door on main level; head cut.
5	Apr. 25, '04,	D. Colliery	Arthur Miller	Driver.....	Hand hurt, necessitating amputation of finger.
6	Jan. 30, "	Springhill	Clifford Elbridge ..	Laborer	Fell in chute and smothered by coal.
7	Apr. 14, "	Marsh Mine.....	Jno. Livingston ..	Overman....	Caught between box and roof; died 16th Ap.
8	Jan. 8, "	Springhill	Jno. Watt.	Laborer	Leg jammed between a full rake and trip.
9	Nov. 27, '03.	Acadia Mine	Jacob McDonell....	"	Foot hurt by a lump of coal.
10	Feb. 12, "	D. Colliery	Arch. McQuarrie ..	Miner	Hand hurt by falling stone.
11	Aug. 20, "	Albion.	Wm. Higgins	"	Leg broken by falling off riding car.
12	Sept. 1, "	D. Colliery	Frank McPherson ..	Slewer	Part of finger taken off.
13	Oct. 6, "	"	John McQuish. ...	Miner.	Sustained serious injuries by being struck by empty rake.
14	" 28, "	Springhill	Percy Hyatt.	Boy	Instantly killed in return side of fire door conveyors.
15	Jan. 26, "	Albion Yard.....	Robert Robinson...	Laborer.....	Instantly killed; slipped under car and car passing over him.
16	" 23, "	Minudie .....	.....	Miner	Leg broken by a fall of clay.
17	Nov. 23, "	Springhill	Wm. Ripley	Driver	Badly bruised; no bones broken.
18	Aug. 5, '04.	"	Arch. Foster	"	Fatally injured by being caught between box and chute; died on reaching bank.

19	"	"	Albion.....	John H. Roy.....	Miner.....	Killed instantly.
20	June 20,	"	Chignecto.....	Wm. Thornton....	".....	Hurt by fall of coal; not considered serious.
21	Oct. 10,	"	Springhill.....	Daniel Vance.....	Driver.....	Leg broken on level between bottle jug and wheel.
22	"	14,	Albion Mine.....	Maynard Gillis....	Laborer....	Leg broken coupling rake.
23	"	1,	Vale Colliery.....	Gabriel G. Jean....	".....	Struck on hip by rake.
24	"	5,	Acadia Bankhead..	Daniel Stewart....	".....	Caught between two loaded boxes.
25	"	6,	Acadia Mine.....	Alex. Flemming...	".....	Head cut and body bruised by jumping off moving rake.
26	Dec. 21,	"	Albion Mine.....	Ray Gillis.....	".....	Hand cut; caught between box and roof.
27	"	23,	D. Mine.....	James Henderson..	Miner.....	Lost an Eye while mining coal; his pick struck the timber, glanced sideways, striking him in the eye.
28	Jan. 23,	"	D. Colliery.....	Neil Ross.....	Loader.....	Ankle badly sprained.
29	"	26,	"	Samuel Wilson....	Miner.....	Got his knee badly cut with an axe while making a wedge.
30	Apr. 30, '04.	"	Springhill.....	Wm. Follet.....	T. carrier..	Leg and arm broken by being struck with empty rake.
31	"	30,	"	McKeen Hunter....	".....	Leg and arm broken by being struck with empty rake.
31	Dec. 31,	"	"	Ephraim Bradley..	Driver.....	Instantly killed; he was sitting talking to loader when the metals gave a heavy thump, broke the timber and buried him under the coal.

CAPE BRETON, INVERNESS, AND VICTORIA COUNTIES.

The sales from Cape Breton County were 4,545,609, compared with 3,279,905 tons in 1903. The production of the Dominion Coal Company was 3,117,648 tons against 3,283,117 tons in 1903. The Nova Scotia Steel and Coal Company raised 492,604 tons against 397,366 tons in 1903.

Progress is being made in the development of the areas of the Cape Breton Coal, Iron and Railway Company.

The progress of the Broad Cove Collieries and of Port Hood has continued in a satisfactory manner.

The appended reports from Mr. John Cadegan and Mr. Neil A. Nicholson, Deputy Inspectors, will show the work done at the collieries in their inspection district.

BRIDGEPORT, DEC. 1ST, 1904.

E. GILPIN, JR., ESQ.

Deputy Commissioner and Inspector of Mines.

SIR,—I beg to submit to you a report on the Southern Coal Mines of Cape Breton County for the year ending Sept. 30th, 1904.

I remain your obedient servant,

JOHN CADEGAN,

Deputy Inspector of Mines.

C. B. COAL IRON AND RAILWAY COMPANY.

I mentioned in my last report that this company were making preparations to develop their property. During the present season a trial slope has been driven at half the angle of the dip, a distance of 200 feet. At 100 feet from surface a deep was turned off at an angle of 45 degrees, and driven on the true angle of dip 127 feet. A level was turned off this deep and driven 92 feet. This level when driven 281 feet will intersect the Main slope at right angles.

The surface excavation of the main slope has been completed.

A colliery office, wash house, two dwellings, one boarding house and reading-room for use of employees, have been erected.

Temporary engine houses, blacksmith shop and warehouse have been built, 3 boilers, 2 hoisting engines and 1 Sullivan straight line air compressor have been installed. This compressor supplies the air for two pumps and two mining machines.

A line of railway $2\frac{1}{2}$ miles in length is being built to connect the colliery with the S. & L. railway.

GOWRIE AND BLOCKHOUSE COLLIERY.

The deeps at this colliery have been driven 3000 feet during the year. Levels were turned off these deeps at a point having 260 feet of surface covering, and driven 1000 feet. A headway was turned off inside of barrier and driven up paralalled to it, a distance of 430 feet. 13 rooms have been turned off in this panel, the width of rooms being 16 feet. The deeps should be far enough advanced by January 1st for another lift.

As the deeps have advanced they have become exceedingly free from water, the coal being of good quality.

A new headframe band with Mitchell Cross over tipples, hopper, scales, shaking and knocking screens, picking belt, and conveyors, have been installed.

Two blocks have been built between the shipping pier and sea shore. This has somewhat helped the shipping arrangements as it allows of more buckets being put on the rope which conveys the coal from the mine to the shipping pier.

A large Rand Corliss air compressor has been installed. Two B. & W. water tube boilers of 500 H. P. have been placed.

A Walker Indestructible ventilating fan of 300,000 cubic feet per minute capacity to be driven by tandem compound Corliss engine is now under construction.

DOMINION No. 2 COLLIERY.

HARBOUR SEAM.

Development work in this and the Phalen seam has steadily advanced during the year.

The north deeps were driven 1100 feet, angle deeps 1200 feet, and north headway 1300 feet.

The south or submarine level was driven 1500 feet. A headway was turned off this level and driven up on the inside of and parallel to the shore barrier a distance of 660 feet.

At the point where the level crosses the shore line the thickness of surface covering is 305 feet. The face of the level is 800 feet beyond the barrier at sea shore.

PHALEN SEAM.

Deeps, headways and levels in this seam were advanced as follows :

Main north deep 1140 feet. New north deep started off level, about 2600 feet north of shaft, has been driven 1050 feet. South deep 2000 feet south of shaft has been driven 960 feet. North motor headway was driven 1000 feet, and south motor headway 1070 feet. Main north level was driven 980 feet, and main south level 1150 feet.

At the time of the last report the coal was hoisted from this seam by two platform cages, since then the main bottom has been completed, and scales and revolving tipples installed, the coal in this case being weighed on pit bottom. The cars after being weighed are run on the revolving tipples and the coal dropped into two storage tanks placed below the pit bottom and having a capacity of ten tons each. Two shaft tanks having each a capacity of ten tons take the place of the cages for hoisting the coal to the surface.

The tanks are loaded from the storage tanks, the doors of which they open automatically while descending, and while one tank is being emptied in the screen on surface the other is being loaded at the pit bottom. These tanks if run steadily are each capable of hoisting 300 tons per hour. The air shaft referred to in last report has been completed and a Walker fan 24 feet diameter and 8 feet wide has been installed together with fan and fan engine house, the latter of wood with steel covering, size of building 15x40x15 feet post.

A second high pressure Norwalk compressor has been installed, and one large and two small air locomotives are ready to go in the mine. The large one is for the Phalen seam, and weighs 20 tons. The two smaller ones are for the Harbour seam and weigh 10 tons each.

Pumping out the Sterling pit has gone on during the year, and the water is now down to within 10 feet of the shaft bottom.

HUB COLLIERY.

Work has been steady at this colliery during the year, the coal being taken from the land or raise workings. The unwatering of the submarine deeps was completed and the deeps extended 150 feet. At 196 feet of cover No. 1 submarine level was turned off and driven 300 feet.

A small section of pillars were drawn in what is known as the Marconi section. Two 12 in. boreholes were put down 100 feet from high water mark. These holes are to be utilized for pumping the water that is made in the under sea workings.

A wash house 80 x 18, steam heated, fitted with bath tubs, etc., and capable of accommodating 250 men, has been erected.

Plans have been projected for a large section of under sea workings at this colliery.

INTERNATIONAL.

There has been no development work done at this colliery during the past year.

Pillars are being extracted at No. 1 and No. 4 levels.

It is the present intention of the management to drive a set of levels through a large area of coal lying between this and the Sterling mine, and convey the coal to the shaft bottom by endless rope haulage. If this is done it will materially add to the life of this colliery, as this area of solid coal, together with the large section of pillars yet undisturbed, should yield nearly one million tons of coal.

A water purifying plant has been installed where all feed water is passed through before going to the boilers. It has a capacity to supply a 700 horse power plant.

A set of worm conveyors has been installed in connection with the screens to convey the coal from the screens to the crushers.

RESERVE COLLIERY.

FRENCH SLOPE.

The deeps in this slope have been driven 1,000 feet.

Levels have been turned north and south, and driven 450 and 300 feet respectively. No. 6 south level was driven 1100 feet to barrier between this and east slope. No. 6 north level was driven 1200 feet to barrier between this and the main slope.

Pillars have been drawn on Nos. 4 and 5 north and on No. 4 south levels.

EAST SLOPE.

The deeps have been driven 957 feet and levels turned north and south. No. 4 south level was driven 1150 feet to barrier between this and Dominion No. 3 colliery.

Pillars have been drawn on Nos. 2 and 3 south levels.

MAIN SLOPE.

This slope can no longer be counted on as a large coal producer as only 17 pairs of miners are now employed. The pillars have all been drawn above No. 11 or lower lift, some of the top pillars on this lift will be drawn. The lower rooms are to be left for a lodgment.

A 12 inch bore-hole has been put down, through which the water will be pumped from this lodgment to the surface.

A large duplex Northy pump is to be installed for this purpose.

CALEDONIA.

Development work has been carried on at this colliery during the year as follows:

The East deeps have been driven 1100 feet. No 6 East level 900 feet. No. 7 West level 1050 feet. No. 7 East 800 feet. No. 8 West 60 feet. No. 8 East 200 feet. The West deeps have been driven 800 feet. No. 4 East level in this deep has advanced 750 feet, and No. 5 East 800 feet, and No. 7 West 300 feet. No. 6 headway along barrier between this and Dominion No. 3 colliery was driven 400 feet. No. 4 West level in No. 2 West deep was driven 600 feet. The East deep was retimbered and track relaid.

From 65 to 70 pair of miners have been steadily employed during the year extracting pillars in this mine, and considering the ground gone over very little coal has been lost.

DOMINION No. 3.

The deeps were extended 300 feet up to January last, when they were stopped and were not again started until September 15th.

No. 10 east level was driven 600 feet, and No. 10 west 100 feet.

Pillars have been successfully drawn during the year on No. 7 west and No. 8 east levels.

The ventilation at this colliery has not been all that could be desired owing to the fans not being sufficient capacity, and to leakage from the broken ground caused by the extraction of the pillars. To remedy this a new air shaft has been sunk, and there is now in course of erection a new Cappell $13\frac{1}{2}$ feet in diameter by 7 feet wide, primarily exhausting but reversable fan with a 16 inch by 18 inch Chandeler high speed engine. This fan will be in operation in December.

DOMINION No. 6.

This is a new colliery which has been opened by the Dominion Coal Company during the present year, and taps the Phalen seam about three-quarters of a mile-south of the old Ontario Mines at Big Glace Bay.

Two pairs of slopes have been driven down on the seam at this point. These slopes diverge from each other as they advance. The course of the east slope being N. 66 deg. E. and that of the north N. 7 deg. W.

The east slope will have a length of 3000 feet and a surface cover-

ing of 280 feet when crossing the shore line, and the north slope a length of 4000 and a cover of 400 feet at the point where it will cross the shore line.

The coal from both slopes will be handled on the one bankhead. The east slope has been driven 400 feet and the north 200 feet. Two air shafts 12x12 feet have been sunk and one connected with each slope.

Natural ventilation is the only means adopted as yet to supply the air current. It is the intention to connect both air shafts and place a fan at each shaft, and separate them by doors so that should an accident happen to one fan, by opening these doors both slopes could be ventilated by the other.

The water is handled by two single and two duplex pumps driven by air. Temporary hoisting engines have been installed at each slope.

An Ingersoll air compressor steam cylinder 20 in. by 24 in. stroke supplies the air for the pumps and mining machines. A site is being cleared for a large number of workmens' dwellings. A colliery office 18 x 42 feet, a wash-house 30x60 feet, and a boarding house 24x60 feet, have been erected.

A line of railway five miles in length branching off the S. & L. railway at Caledonia junction and following the Old Schooner Pond road bed, is being built to connect the colliery with the S. & L. railway. This branch will be completed by January 1st.

SUBMARINE WORKINGS.

The question of submarine workings, the size of openings made, pillars and barriers left under different conditions was one that occupied the attention of your deputies to some considerable extent during the present season.

The data which we were able to secure on the matter was of a very limited character, so that outside of the valuable advice and assistance rendered us by yourself, we had to rely on our practical knowledge, and that of some of the mining men in connection with the collieries of the Dominion Coal Company to arrive at a proper solution of the question.

We had several consultations with Mr. King, General Superintendent of Mines, and his assistant, together with the managers of

Dominion No. 1 Dominion No. 2, and Hub collieries, who received us courteously and were as anxious as ourselves that the best and safest method be adopted. The two principal questions that occupied our time was, if the pillars were left larger than was necessary up to a point where they could be removed with safety, or a system of long wall adopted. The coal thus left would be a loss to the company, a loss to the Government and consequently a loss to the people.

On the other hand, if the pillars were not left of sufficient size to remove all reasonable doubt of a crush or creep taking place, then the mine would become unsafe and might result in great loss of life and destruction of property. Your deputies took the ground that if they err at all they would err on the side of safety to life and property.

With this end in view, and after discussing the matter from its different standpoints, we arrived at the following conclusions :

All deeps, headways, levels and cross cuts to be not more than 12 feet in width. Rooms not to exceed 20 feet in width in the mining.

Pillars in the Harbour seam from 180 to 250 feet of cover to be 27 x 75 feet. Then as the workings advance to the dip, for every 50 feet additional cover obtained, 3 feet, or half the thickness of the seam is to be added to the width of the pillars. According to this rule when the cover reaches 1,000 feet, the size of the pillars in this seam will be 72 x 75 feet. In the Hub and Phalen seams the size of pillars to be left from 180 to 250 feet, of cover is 30 x 75 feet, and as the workings advance to the deep, 4 feet, or half the thickness of the seams will be added to the width of the pillars which will leave the size of the pillars in those seams when they reach a cover of 1000 feet to be 90 x 75 feet.

The angle of dip in those seams is about 6°, which in the case of the Harbour seam leaves three feet, and in the Hub and Phalen four feet, to be added to the width of the pillars for every 833 feet that the workings go to the deep.

The Government Inspectors of Mines, have agreed this 10th day September, 1904, to the following:—

Size of Pillars and width of rooms in workings under Submarine Areas below 180 foot limit, to be governed accordingly.

Cover in Feet.	HARBOR SEAM.		HUB & PHALEN.		% Coal Left in.
	Room.	Pillar.	Room.	Pillar.	
200ft.	20'	27 x 75	20'	30 x 75	51
250	"	27 x 75	"	30 x 75	51
300	"	30 x 75	"	34 x 75	54
350	"	33 x 75	"	38 x 75	56
400	"	36 x 75	"	42 x 75	58
450	"	39 x 75	"	46 x 75	60
500	"	42 x 75	"	50 x 75	61
550	"	45 x 75	"	54 x 75	63
600	"	48 x 75	"	58 x 75	64
650	"	51 x 75	"	62 x 75	65
700	"	54 x 75	"	66 x 75	66
750	"	57 x 75	"	70 x 75	67
800	"	60 x 75	"	74 x 75	67
850	"	63 x 75	"	78 x 75	68
900	"	66 x 75	"	82 x 75	69
950	"	69 x 75	"	86 x 75	69
1000	"	72 x 75	"	90 x 75	70

All crosscuts not to exceed 12 feet wide.

I am pleased to report that the number of fatal accidents in the Southern Collieries during the past year is not so large as that of 1903. You will notice from the table attached that the number of fatal accidents during the past year was 13 as compared with 18 during 1903. The number of other accidents classed as serious remains about the same. I append table of accidents together with table showing the number of tons of coal produced per accident, and remain,

Yours truly,

JOHN CADEGAN,

Deputy Inspector of Mines.

Accidents in Cape Breton Coal Mines, Southern District, Year ending Sept. 30th, 1904.

No.	DATE.	MINE.	NAMES.	AGE	OCCUPATION.	REMARKS.
	1903					
1	Oct. 11.	Dominion No. 2.	John McCuish.....	30	Foreman	Killed by fall of stone from roof.
2	" 22.	Reserve	John McKeys	27	Laborer	Foot crushed by railway car.
3	" 24.	Dominion No. 2.	John Douglas.....	35	Machine Runner...	Leg and collar bone broken by fall of coal.
4	" 30.	" "	Chas. Dickenson.....	36	Miner.....	Foot cut off by fall of stone from roof.
5	" 31.	" "	John McDonald	30	Shaft man.....	Killed; caught between cage and pullies.
6	" "	" "	Dan McDonald	23	"	Killed; fall of cage down shaft.
7	Nov. 12.	" No. 3.	John Morrison	46	Miner	Foot cut off by fall of roof coal.
8	" 16.	" No. 2.	John Francis	23	Loader.....	Leg broken; jammed between box and coal.
9	" 19.	" No. 3.	Sam Yarne.....	38	Shot Firer.....	Fracture of thigh, fall of stone from roof.
10	Dec. 7.	" "	Thos. Fiander.....	24	Machine Runner...	Bruised about hips by fall of coal.
	1904					
11	Jan. 12.	International	Mick McKinnon.....	26	Miner.....	Killed by fall of stone from roof.
12	" 21.	Caledonia	Norman Nicholson...	24	Machine Runner...	Back broken by fall of roof coal, died April 8th.
13	" 29.	Dominion No. 2.	Hector McEachern...	33	Motor Driver.....	Leg broken; struck by motor.
14	Feb. 3.	Gowrie	Dan Matheson.....	48	Miner	Leg and arm broken by fall of stone from roof.
15	" 6.	Reserve	Richard Colbert.....	18	Laborer	Arm broken; caught between boxes.
16	" 20.	"	Stephen Dulhanty ...	19	"	Hand crushed between cars.
17	" 26.	Dominion No. 2.	George Mootery	50	"	Killed; struck by runaway boxes.
18	" 29.	Caledonia	Stephen McNeil	46	Miner.....	Killed by fall of roof coal.
19	" 29.	"	Alex. Borden	60	"	Leg broken by fall of roof coal.
20	March 5.	Dominion No. 2.	Dan. McDonald.....	48	Machine Runner...	Leg broken by fall of coal from face.

21	March 12.	Caledonia	John Ryan	61	Miner	Killed by fall of stone from roof.
22	" 14.	Hub	Alex. McCuish	20	Laborer	Arm broken; struck by car brake.
23	" 16.	Dominion No. 2.	Mick Pembroke	17	Driver	Ankle broken; caught between box and prop.
24	" 21.	"	Geo. L. Cord	34	Helper	Leg broken by fall of coal from face.
25	" 28.	"	E. Gadding	25	Loader	" " " "
26	April 6.	"	Norman Hutchings	20	Landing Tender	Collar bone broken; caught between box and pillar.
27	" 12.	Caledonia	Wm. McLeod	65	Foreman	Leg broken; fell on stone on surface.
28	" 28.	Dominion No. 2.	John F. McNeil	18	Driver	Arm broken; caught between box and prop
29	May 6.	Reserve	Nat. McPhee	38	Shot Firer	Fracture of thigh; fall of stone from roof.
30	" 10.	Gowrie	Lapata Santo	27	Laborer	Leg broken; caught between box and pillar.
31	" 17.	Reserve	John Mack	38	Miner	Face and hands severely burnt with gas.
32	" 17.	"	Dan. B. McPhee	42	"	" " " "
33	" 28.	Dominion No. 2.	John McLeod	60	Doorkeeper	Killed; struck by motor.
34	June 6.	Hub	Archy McInnis	21	Driver	Hip broken; caught between box and pillar.
35	" 10.	Caledonia	James Casey	35	Road Man	Hand slightly burnt with gas.
36	" 10.	"	Sam. Croker	34	"	" " " "
37	" 10.	"	Dan. Jobs	36	Miner	Face and hands " " " "
38	" 10.	"	Norman McVicar	26	"	" " " "
39	" 10.	"	Silas Stillman	32	"	" " " "
40	" 14.	Gowrie	Angus Holmes	31	"	Fracture of both legs; fall of stone from roof.
41	" 22.	Hub	William Webster	16	Laborer	Leg broken; struck by coal on screens.
42	" 24.	International	Alex. McVicar	46	Miner	Killed by fall of coal from face.
43	July 8.	Dominion No. 2.	Edward Warren	21	Driver	Killed by fall of stone from roof.
44	" 19.	"	John Close	55	Shift Man	Fracture of thigh; fall of stone from roof.

Accidents in Cape Breton Coal Mines, Southern District, Year ending Sept. 30th. 1904 — (Continued.)

No.	DATE.	MINE.	NAMES.	AGE.	OCCUPATION	REMARKS.
45	" 21.	Dominion No. 2.	Jesse Westaver	21	Motor Driver	... Foot crushed between motor and box.
46	Aug. 29.	International.....	Owen Morrison	19	Road Man	... Ankle broken; back and body injured. ... Struck by runaway box on deep.
47	Sept. 20.	Reserve	Philip Ormond	24	Miner.....	... Fractured knee cap; fall of coal from face.
48	" 24.	Dominion No. 2.	John D. McNeil	41	Brattice Man	... Killed by explosion of gas.
49	" 27.	International.....	Joseph Ferguson ...	20	Labourer ..	... Leg broken; caught between timber tram and prop.

Table showing the number of tons of coal produced by the Southern Collieries of Cape Breton County, (Dominion No. 1 included) for fatal and serious accidents from Sept. 30th, 1903, to Sept. 30th, 1904.

NAMES OF COLLIERIES.	Tons produced	Total accidents	Tons produced per accident	Serious accidents	Tons produced per accident	Total number accidents	Total tons produced per accident
Dominion No. 1	334,789	1	334,789	6	55,797	7	47,827
Dominion No. 2	680,511	7	97,215	8	85,014	15	45,367
Dominion No. 3	387,486	.....	.....	7	55,355	7	55,355
Dominion No. 6	1,555	.....	.....	.....	.....	.....	.....
Caledonia	550,386	3	183,462	7	78,626	10	55,038
International	204,782	2	102,361	2	102,311	4	51,195
Hub	134,036	.....	.....	3	44,678	3	44,678
Reserve	824,103	.....	.....	7	117,729	7	117,72
Gowrie and Blockhouse	42,055	.....	.....	3	14,018	3	14,018
	3,159,703	13	43,054	43	73,481	56	56,423

OLD BRIDGEPORT, C. B., Nov. 15 1904.

DR. E. GILPIN,

Deputy Commissioner and Inspector of Mines :

SIR :—I have the honor to submit my annual report on the Northern Division of the mining district of the Island of Cape Breton.

The condition of the mines, is, upon the whole, very satisfactory. The coal and coke business in this district is still on the increase. Port Hood has this year an increase of 7,247 tons; Inverness Railway and Coal Co., of 63,245 tons; N. S. S. & Coal Co., of 95,238 tons of coal. The latter company shipped 33,561 tons of coke and 3,417 tons pig iron during the year.

Thinking it might be of interest to the miners and operators of Cape Breton, I obtained an estimate of the quantity of powder used in several of the mines. By making a comparison between this and the amount of coal produced, I find that the quantity of powder required to produce a ton of coal varies greatly in the different mines. For example: In Dominion No. 1, 75,642 lbs. of powder produced 344,123 tons of coal, therefore one lb. of powder produced or $4\frac{1}{2}$ tons of coal. In Inverness 121,181 lbs. powder produced 208,484 tons of coal, therefore one lb. of powder produced or about $1\frac{3}{4}$ tons of coal.

From these figures it will be seen that the miners of Dominion No. 1 produced about $4\frac{1}{2}$ tons of coal for every pound of powder used, while the miners of Inverness only produce $1\frac{3}{4}$ tons per pound. The height of the Phalen coal seam, the width of the bords and the easier blasting accounts for much of the difference.

I regret to report twenty-seven accidents in this district during the year; two widowers, eight married men and fifteen unmarried men and two boys were injured. Six of these accidents proved fatal.

I am pleased to be able to report that the management of the collieries have complied with the mining law and have taken every precaution to protect the lives of their employees.

PORT HOOD COAL COMPANY.

During the last year this mine only worked 221 days. The output is 81,765 tons, an increase over last year of 7,247 tons. The slopes have been extended 420 feet and levels were turned off north and south and driven in a distance of 300 feet from the main slope. The angle continues regular. The coal has improved in quality, and the thickness of the seam has increased. No. 2 level north has been advanced 1550 feet and is now in a distance of 4000 feet. On this

lift a double balance with 22 bords and a single balance with 11 bords was put in operation during the year. No. 2 level south was extended 700 feet. A double balance was driven and is ready for operation.

The general condition of this mine for ventilation and drainage is good. The slopes are now down 2000 feet from the surface and are 850 feet under the sea. There are 700 feet of strata overlying the coal at the face of the deeps. The average amount of air circulating through this mine is 30,000 cubic feet per minute. This mine was visited 11 times during the year.

MABOU COAL MINING COMPANY, LTD.

During the year this slope was sunk 360 feet and levels turned off east and west. The east level is driven 200 feet from main slope; the west 156 feet. Seven bords twelve feet wide were turned off the east side and five bords on the west.

The coal is mined by machines. The mine was idle five months during the year. The average amount of air circulating through the mine is 6000 cubic feet per minute.

This colliery was visited six times during the year.

INVERNESS RAILWAY AND COAL COMPANY.

This company last year increased their output 63,245 tons. No. 1 slope has been extended 850 feet. A downthrow of 5 feet 6 inches was pierced through 100 feet from the face of the deeps. This slope is now down 2500 feet from the surface and is driven under the sea 1250 feet. The strata overlying the coal at the face of the deeps is 550 feet thick. Levels have been extended east and west. Their respective distances from main slope are as follows:—

No. 2 level east, distance from main slope	3000 feet.
No. 3 " " " " " "	2600 "
No. 4 " " " " " "	700 "
No. 5 " " " " " "	110 "
No. 3 " west " " " "	1400 "
No. 4 " " " " " "	650 "
No. 5 " " " " " "	150 "

The average amount of air circulating through the mine is 50,000 cubic feet per minute. This mine was visited ten times during the year.

INVERNESS, No. 2 SLOPE.

During the year this slope has been sunk 900 feet and levels turned off east and west. No. 2 level east has been extended 888 feet from

main slope, No. 3 level 650 feet; No. 3 level west 410 feet from the main slope. No. 1 slope is connected with No. 2 and the coal is conveyed by horses through No. 2 east level to the main haulage in No. 1.

The average amount of air circulating through the mine is 30,000 cubic feet per minute. This mine was visited ten times during the year.

NEW CAMPBELLTON, VICTORIA Co.

The old mine was abandoned in December, 1903, and in April, 1904, a new slope was started in the same seam 2000 feet north of the old slope and diverging at an angle of 34 degrees north. This slope is down 575 feet with levels turned off north and south. The north level is driven in 156 feet; the south 200 feet. A travelling road is driven from the bottom lift towards the surface and a shaft sunk 20 feet. Ladders are placed in the shaft for the men to ascend and descend. The mine is in good condition to have an output of 200 tons per day. The coal has improved in quality and the thickness of the seam has increased.

The fan that was at the old mine has been placed at the new slope and is giving good results. The average amount of air passing through this colliery is 20,000 cubic feet per minute.

This mine was visited five times during the year.

SYDNEY COAL COMPANY.

The output of this colliery is one-third per cent. less than that of last year. The mine is in good condition. The levels have been extended 66 feet during the year and four rooms turned off the main level. The ventilation, which is natural, is fair. The average amount of air passing through this colliery is 4000 cubic feet per minute.

This mine was visited twelve times during the year.

SYDNEY No. 1.

This is a very extensive mine, employing a large number of men and boys. The coal is conveyed to the shaft bottom by the endless rope system of haulage. On the south side the length of the haulage rope is 20,000 feet, and it works very smoothly. On the north side the trip system is still used for conveying the coal to the pit bottom. There are twenty pair of men drawing pillars in the Queen Pit. This coal is landed at the shaft bottom by tail rope haulage.

The work of development has been continued during the year. The north deep is now down a distance of 6930 feet; the south deep. 8382 feet.

The output of this mine has increased very materially during the year, amounting to 262,891 tons. Of this 133,098 tons were mined in pillars under a cover of 900 feet. These pillars have been drawn very successfully, without any accident or loss of coal.

The mine is in good condition and the ventilation fair. The average amount of air passing through it is 97,000 cubic feet per minute. This mine was visited thirteen times during the year.

SYDNEY No. 2.

During the year the slopes were sunk 1650 feet, making a total length of 4250 feet from the surface. Levels were also turned off north and south. Their respective distances from the main haulage are as follows :

Distance of No. 1 level north from main haulage,	620 feet
“ “ 2 “ “ “ “ “	610 “
“ “ 3 “ “ “ “ “	650 “
“ “ 1 “ south “ “ “	1510 “
“ “ 2 “ “ “ “ “	1270 “
“ “ 3 “ “ “ “ “	1280 “

The average amount of air passing through this mine is 37,000 cubic feet per minute.

This mine was visited seven times during the year.

SYDNEY No. 3.

This mine increased its output over 50 per cent. during the year. Development has been pushed ahead vigorously. The slopes have been sunk 1508 feet and are now down 3145 feet with levels turned off north and south. Hand-pick mining has been dispensed with, and the mine equipped with mining machines. A tail rope system has been installed in No. 3 level north, to convey the coal to the main haulage. A number of small donkey engines have been erected at the top of the headways to draw the coal from the men. This system of haulage does away with a number of horses and is giving good results. The respective distances of levels from main haulage are as follows :

Distance of No. 1 level north from main haulage,	1100 feet.
“ “ 2 “ “ “ “ “	1420 “
“ “ 3 “ “ “ “ “	1010 “
“ “ 4 “ “ “ “ “	770 “
“ “ 5 “ “ “ “ “	300 “
“ “ 1 south “ “ “ “	585 “
“ “ 2 “ “ “ “ “	771 “
“ “ 3 “ “ “ “ “	845 “
“ “ 4 “ “ “ “ “	850 “
“ “ 5 “ “ “ “ “	250 “

An error occurred in last year's report in reference to accidents at this colliery. The report stated that "seven miners were injured fatally." This was incorrect, as there were no fatal accidents at this colliery during that year.

The average amount of air circulating through this mine daily is 48,000 cubic feet per minute.

This mine was visited eleven times during the year.

N. S. STEEL & COAL COMPANY.

The following is a list of machinery installed at their collieries during the past year :

No. 1. COLLIERY.

One new B. & W. boiler has been added to Battery at No. 1 Colliery and four locomotive type boilers removed. There are also two B. & W. boilers of 274 H. P. These are supplied with gas from thirty Bauer ovens. Preparations are now being made to supply a third boiler from the same ovens.

A steel bankhead is in course of erection and will probably be completed in about two weeks time.

A No. 3 compressor, manufactured by Norwalk Iron Works (air and steam combined) and capable of producing 4080 cubic feet of air per minute at eighty revolutions, was installed.

A Capell fan, twenty feet in diameter, with four inch water gauge, was erected at the Queen Pit.

No. 3. COLLIERY.

The Murphy fan was removed from the Queen Pit and erected at No. 3. The blast furnace blown in, on August 30th, is operating successfully.

At the blast furnaces there are six tubular boilers rated at 100 H. P. each, and furnished with a portion of the gases from a battery of Bernard ovens. A saving is thus effected, as it requires no handling of coal and no firemen—one water tender taking care of the six boilers. As doors are always closed, there is also a saving in the repairs to the furnace and tubes. In order to get good results from the gas, it was found necessary to put in an induced draft fan so that the gas could be brought to the boilers without interfering with the working of the ovens.

Eighty new coke ovens were completed this year. Forty more are now under construction.

Three new locomotives were put into service this year, making a total of nine, now owned by the company.

DOMINION No. 1 COLLIERY.

This mine has now an output of 2300 tons per day and is in better condition than before the fire. In order to submerge the fire area, it was found necessary to let 580 million gallons of water into the mine. In addition to this large quantity, it is estimated that the mine made 263 million gallons during the time the water was in the mine, making a total of 843 million gallons pumped out when the mine was drained off on the 12th of May, 1904.

966,298 cubic feet of gas were removed in large quantities at intervals. This does not include the small quantities of gas which were gradually removed as the water receded. Great credit is due Manager McKenzie and his officials for the care and precaution they exercised when removing such large quantities of gas without accident and restoring the ventilation as the water receded.

The average amount of air passing through the mine is 104,000 cubic feet per minute. This mine was visited fourteen times during the year.

The following improvements were made: The boilers were all fitted with Parson's blowers. A new sludge pocket was built to burn the sludge from the wash plant. Two new compound air cylinders for No. 1 and 2 compressors.

I herewith append a list of accidents, and remain

Yours respectfully,

NEIL A. NICHOLSON,

Deputy Inspector of Mines.

Accident List of Northern Division and Dominion No. 1.

DATE.	MINE.	NAME.	AGE.	OCCUPATION.	REMARKS.
1903					
Oct. 4.	N. S. S. & C. Co.	William Tobin	34	Overman	Slightly injured by being jammed between box and pillar.
" 9.	"	Andrew Bailie .....	...	Miner	Leg broken by fall of stone.
" 12.	Dominion No. 1.	Hector MacLean	48	"	Slightly injured by fall of coal.
" 21.	"	Patrick McNeary	25	"	Fatally injured by fall of coal.
" 26.	N. S. S. & C. Co.	Ronald McDonald .....	...	"	Leg broken by fall of coal.
Nov. 10.	"	John Surrolo	26	Laborer	Slightly injured by fall of stone.
" 14.	"	Robert Howlet	32	Miner	Fatally injured by fall of stone, fracturing skull.
Dec. 18.	"	Roderick Ferguson	32	"	Killed by fall of stone.
1904					
Jan. 18.	"	George Boyce	14	Driver	Leg broken by runaway tubs.
" 22.	"	Dougall McKinnon	21	Miner	Arm broken by fall of stone.
" 27.	"	Dan. A. Ferguson	43	"	Slightly burned by gas.
Feb. 9.	"	Lisle Shinner	34	"	Spine injured by fall of stone.
Mar. 12.	Dominion No. 1.	Michael McPhee	29	Laborer	Leg broken by fall of stone.
" 26.	Broad Cove	Angus McDougall	23	Miner	Slightly injured when relighting shot.
Apr. 11.	Dominion No. 1.	John Buchanan	45	Laborer	Had leg and two ribs broken by runaway box.
" 15.	"	Angus Currie	51	Miner	Had his collar bone broken by fall of stone.
June 24.	Broad Cove	Neil McLellan	24	Shiftman	Leg broken by being caught by an empty trip.
" 27.	"	John J. Collins .....	...	Driver	Slightly injured by being jammed between boxes.
July 6.	"	Charles McLean	19	"	Wrist broken by contact with tubs.
" 11.	"	Melvin McLeod	20	Cage runner	Slightly injured, caught between box and pillar.
" 19.	Dominion No. 1.	Savannah Wencil	41	Laborer	Knee injured by fall of stone.

Aug. 4.	N. S. S. & C. Co.	John A. McHughall.	18	Loader.....	Killed by fall of stone.
" 29.	N. S. S. & C. Co.	Emmanuel Salpin....	39	Miner	Dislocated shoulder.
Sep. 16.	"	Archie Young.....	22	"	Fatally injured by fall of coal.
" 23.	"	Bertie Young	16	Driver	Four fingers smashed by donkey engine.
" 24.	"	Stephen McLean.....	70	Pumpman	Fatally injured by falling against pump.
					Caught between tub and Sampson post; died from injuries.
Apl. 18.	"	Christian Sonerson....	23	Laborer....	
" 21.	"	Donald McNeil.....	50	Miner	Slightly injured by fall of coal.
" 21.	"	David Pratt.....	27	"	Slightly burned while firing shot.
" 21.	"	John A. McIntyre....	...	"	Thigh broken by fall of coal.
May 14.	"	John Hyde	14	Driver	Injured by empty tubs; leg broken.
" 22.	Port Hood	Robert Grey .....	...	Miner	Fingers crushed between timbers and empty tubs.
June 9.	"	John A. Clisholm ....	...	Laborer....	Leg crushed by jumping on moving car.
" 11.	Dominion No. 1.	William Elsworth....	25	"	Leg broken by being caught in cage.

GOLD.

The production during the year 1904 amounted to 14,279 ozs. as compared with 25,198 ozs. during the year 1903.

Mr. Weatherbe's inspection reports, with comprehensive notes and accompanying explanatory plates, are attached, and cover the progress at the mines for the year.

ANNUAL REPORT ON THE GOLD MINES

FROM SEPTEMBER 30TH, 1903, TO SEPTEMBER 30TH, 1904.

To DR. E. GILPIN,

Deputy Commissioner and Inspector of Mines :

I beg to submit the following report on the annual inspection of the gold mines for the past fiscal year.

At the annual meeting of the Nova Scotia Mining Society last winter, the question of gold mining was very thoroughly gone into during discussion, and many valuable interchanges of opinion regarding important points in connection therewith were given.

The Government, anticipating a special discussion on the question of *deep mining*, on which they had legislated during the previous session, employed Mr. Faribault of the Geological Survey, to make a special report on the subject which was gone into very fully. One direct result of this discussion was the amendment of the above legislation, so that aid to a deep shaft would be given by the Government to the whole sinking, from the surface to a depth of 2000 feet, instead of requiring the miner to do the first 500 feet of work at his own expense as provided by the first Act. This amendment brought forth several bona fide applications for the aid almost immediately. In some of the districts to which these applications applied, Mr. Faribault's services were again used in reporting on their suitability. The districts where this aid was asked include Isaac's Harbor, Malaga, Caribou and Sherbrooke.

It should be particularly mentioned, that the past season has marked a stage in Nova Scotia gold mining not before reached, two mines having attained vertical depths of 1000 feet or over, and at both places (over 100 miles apart), was gold found, presumably, in paying quantities.

Although the returns for the past season, and more noticeably for the present season, are smaller than usual, this does not necessarily show a falling off in the industry. In fact it might rather tend to prove the suggestion that the day of the small miner and tributer are rapidly drawing to a close; the rich and small leads and chimneys being to a large extent exhausted to the depth considered profitable by small scale work.

During the winter one of the largest producing districts (Sherbrooke) was practically closed by being cut off from fuel supply on account of navigation closing earlier than usual.

On the other hand large scale operations, preparatory, it is hoped, to an output of gold larger in an increasing proportion, are in progress at several districts, and in one or two practically new localities prospecting of an intelligent character is being done.

The antimony mines at West Gore have been opened during the year, and the ore recently mined, is showing free gold in considerable quantities, as well as that mechanically or chemically combined with the stibnite.

IMPROVED METHODS AND MODERN MACHINERY. A marked improvement can be noticed in the methods of working during the past few years, and the most modern machinery is installed in both the mining and re-duction plants at many of the larger mines.

The sinking of several large vertical shafts during the year, and the mining of wide ore bodies at deep levels in one or two cases, have occasioned some good examples of both shaft timbering and square set work. In one mine at a vertical depth of almost 1000 feet below the surface, and where the ore was being worked from 16 feet to 20 feet in width, squared frame timbers as large as 16 inches in thickness were used in the levels and stopes.

Where a few years ago hand-steel was almost universally employed in stoping, this is now rarely seen at any of the larger mines, and machine drills with steam, air, and in some cases with electricity as a motive power, are the rule. This, no doubt, in our hard rock, effects a considerable saving, except in some isolated cases of extremely narrow belts, or where a gouge seam or soft slate allows the vein to be mined almost without the use of "powder."

The jack-head or Cornish pump is less frequently seen now-a-days in the gold districts than formerly, although one wonders whether this simple and efficient contrivance is not, in many cases, more advantageous than some of the steam pumps which are seen, supplied with long and wasteful lines of steam pipe and tended by men who know little of their business, thus entailing constant care and repairs.

However, even with all the improvements and most practical and economical methods that can be used, the fact cannot be overlooked, especially now that attention is being necessarily attracted to the large low grade deposits, that the future salvation of our gold mines will be the harnessing to practical use of the splendid water powers which are at present lying dormant throughout the province. Dolliver Mountain has already done this with a substantial and satisfactory saving in expense of working, and in at least one other district specifications

are given, and it is understood that the contract is closed for a plant generating from 750 to 1000 H. P. This latter plant will entail an electrical transmission line of about 7 miles.

I am told that at Waverly the water power arrangements are to be remodelled and the power transmitted electrically.

A movement is on foot, it is said, to generate power on the Medway River, at Bang's Falls, by which the districts of Brookfield, Molega, Fifteen Mile Brook, Greenfield, Caledonia and even Whiteburn and Leipsigate may be supplied with cheap power.

Gold River too has a water power which may shortly be put to practical use.

With the idea of reducing the question of comparative costs of steam versus water power combined with electricity, to figures, the following summary table has been prepared and refers to a district where peculiar opportunities are offered for the careful study and preparation of such a statement.

The figures, of course, are more or less arbitrary and approximate, but if anything, err in favor of the steam plant.

The estimate deals with the surface plants and labor, while conditions underground are not touched upon, as in both cases they would be practically the same.

Moreover, the cost of all labor and plant on the surface which would in each case be identical, is in each case either eliminated or accounted for.

The somewhat complex question of cost of fuel and transportation plant (railroad or cableway, etc.) including its first cost, interest on cost, operating and maintenance expenses, has not been gone into; but coal, which in the case cited would undoubtedly be the fuel used, is put down at an average cost of \$4.90 per ton, delivered at the boilers.

Another phase of the question which has not been attacked is the general repair and maintenance account, which it is estimated would in the case of the steam plant be largely in excess of the water power plant.

Although the table has been prepared from detailed items, only a summary has been set down, as the object of these notes is really for the purpose of exciting more public interest in this all-important subject than has hitherto been accorded it. The estimates are made for a plant to mine to at least 500 feet in depth and employing a 40 stamp mill.

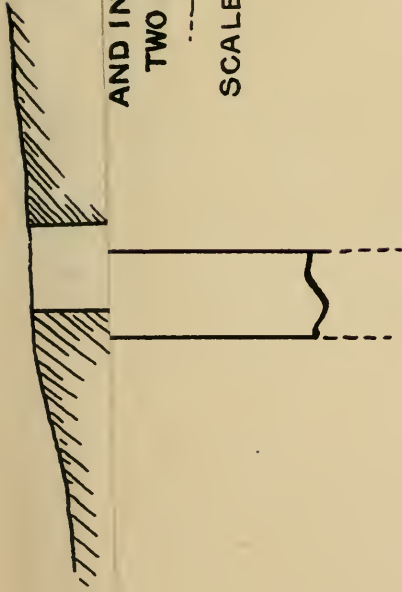
SUMMARY STATEMENT SHOWING COSTS OF INSTALLING AND OPERATING
STEAM PLANT.

ITEM.	First cost and Installation.	Interest on capital at 5% per annum.	Cost of fuel and labour per year (300 days)
Pumping Plant.....	\$4450.00	\$222.50	.....
Fuel used.....	.....	.....	\$2205.00
Labour.....	.....	.....	900.00
Shaft house and Engine house plant.....	9550.00	477.50	.....
Fuel used.....	.....	.....	15876.00
Labour.....	.....	.....	4569.00
Mill plant.....	4875.00	243.75	.....
Fuel used.....	.....	.....	8085.00
Labour.....	.....	.....	5229.00
Coal storehouse at tide- water.....	1800.00	90.00	.....
Totals	\$20675.00	\$1033.75	\$36864.00

SUMMARY STATEMENT SHOWING COSTS OF INSTALLING AND OPERATING
WATER POWER AND ELECTRICAL PLANT.

ITEM.	First cost and installation	Interest on capital at 5% per annum	Cost of labor per year (300 days)
Water power and pump- ing plant.....	\$21936.09	\$1096.80	.....
Labor .....	.....	.....	\$1329.00
Shaft-house and engine- room plant	\$10110.00	505.50	.....
Labor.....	.....	.....	1770.00
Mill plant	1975.00	98.75	.....
Labor.....	.....	.....	2430.10
Totals	\$34021.09	\$1701.05	\$5529.10

SOUTH



NORTH

AND INTERSECTING
TWO BELTS OFORE

SCALE = 50' TO 1 INCH.

04

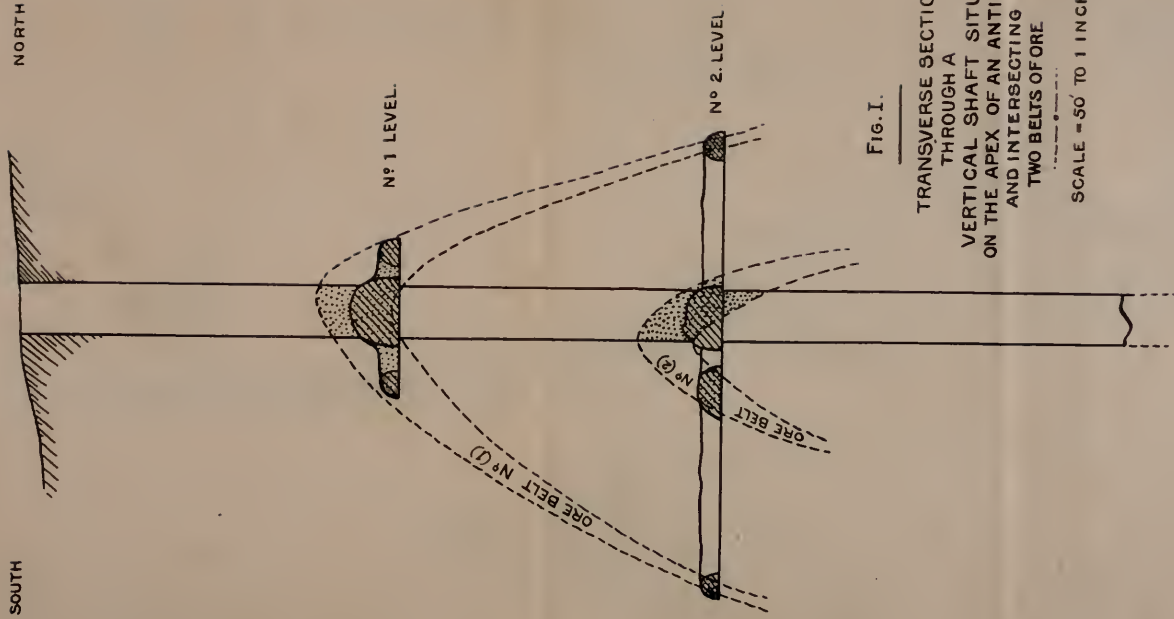
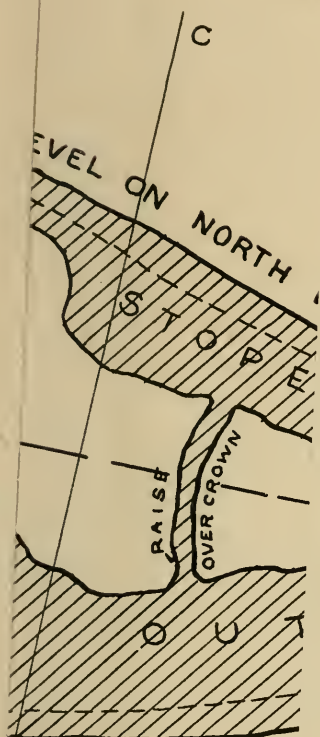


FIG. I.

TRANSVERSE SECTION
THROUGH A
VERTICAL SHAFT SITUATED
ON THE APEX OF AN ANTICLINAL
AND INTERSECTING
TWO BELTS OF ORE

SCALE = 50' TO 1 INCH.



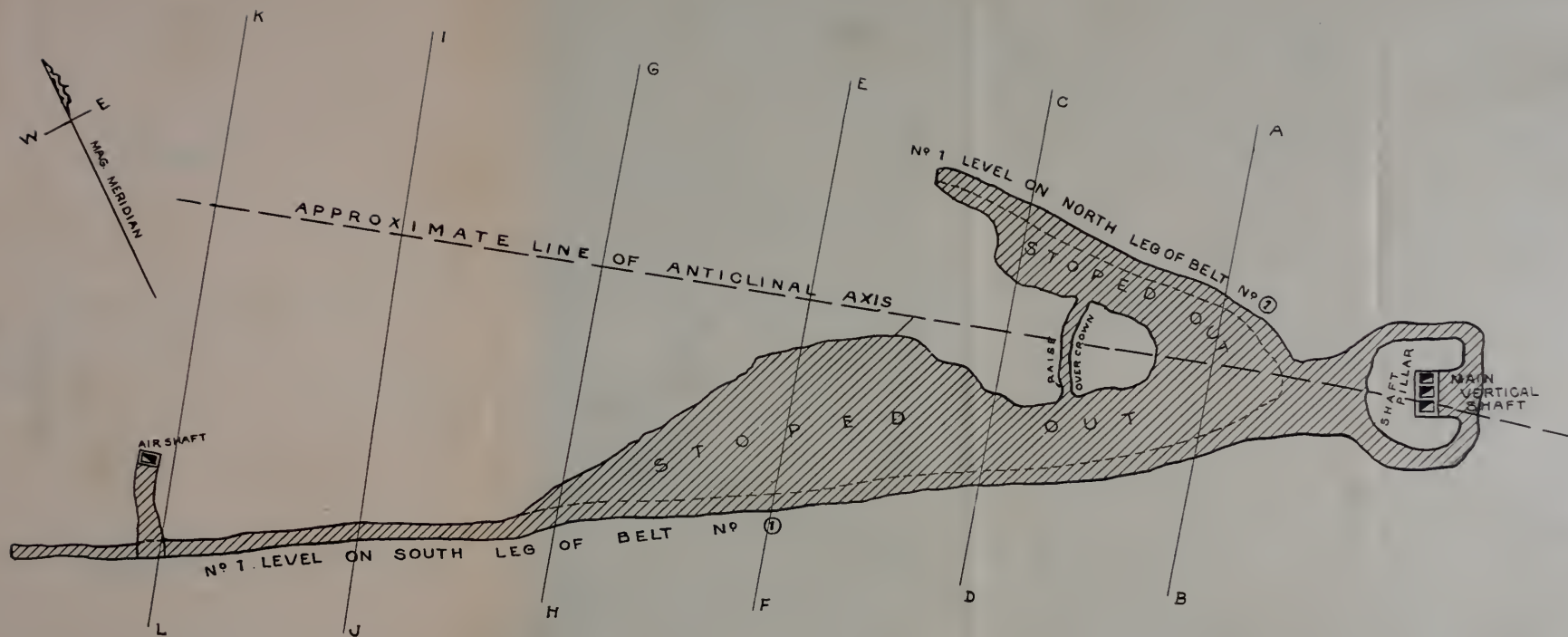


FIG. II.
HORIZONTAL PROJECTION
OF Nº 1. LEVEL IN FIG. I.

SCALE - 50' TO 1 INCH

LEG OF BELT N° ①

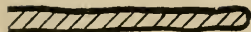


FIG. — — — — —

HORIZONTAL
OF N° 2 LE

SCALE =

TH LEG OF BELT N° ①



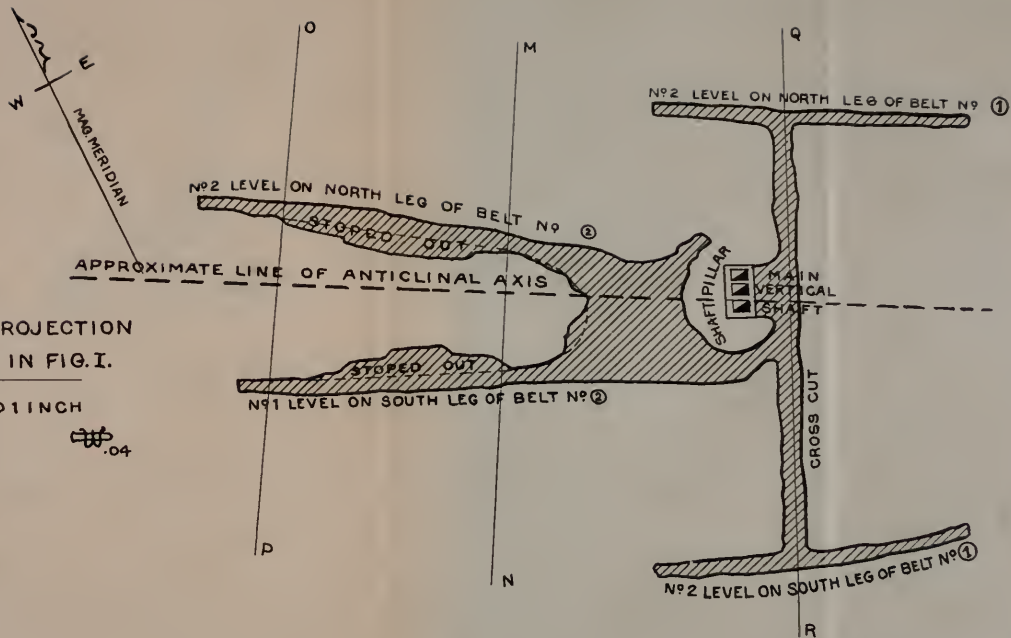
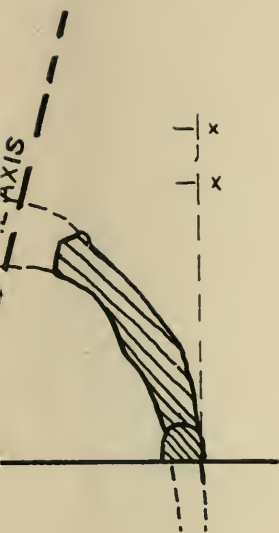


FIG. III

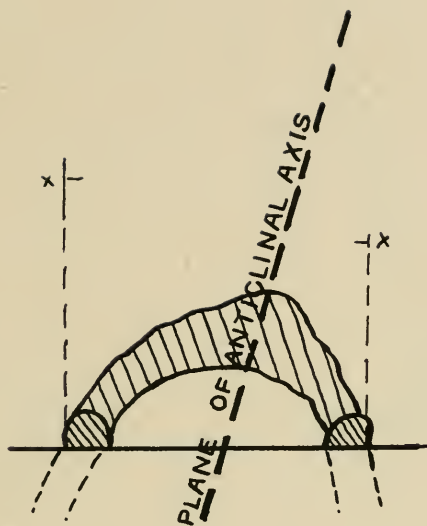
HORIZONTAL PROJECTION
OF Nº 2 LEVEL IN FIG. I.

SCALE = 50' TO 1 INCH

0.04



D



A ————— B

HTS

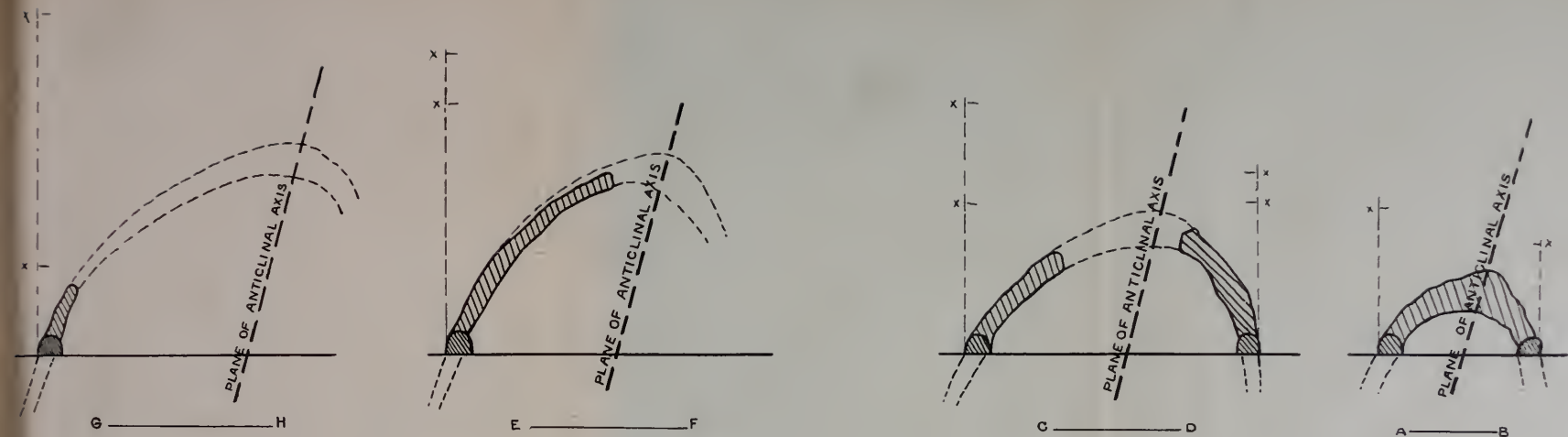


FIG. IV.
TRANSVERSE SECTIONS
ON FIG. II.

SCALE - 50' TO 1 INCH

11.04

NOTE - THE MARK THUS:- (x) ON THE VERTICAL DOTTED LINES REPRESENT THE "DEVELOPED" HEIGHTS OF "CROWN" AND STOPING RESPECTIVELY
THE SHADED PORTION SHOWS LEVELS AND STOPING-

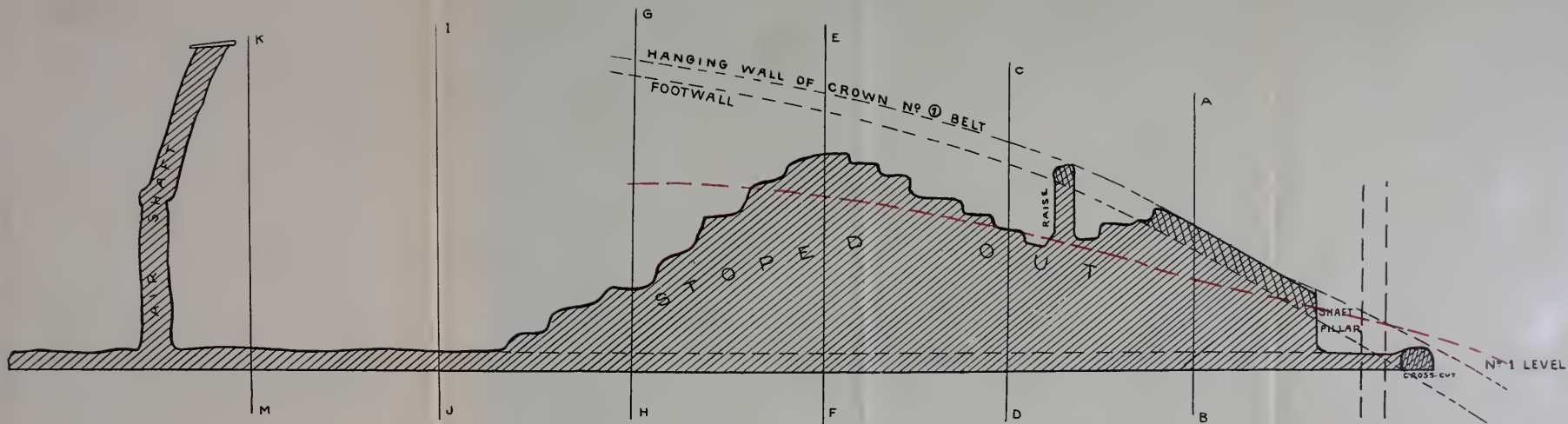
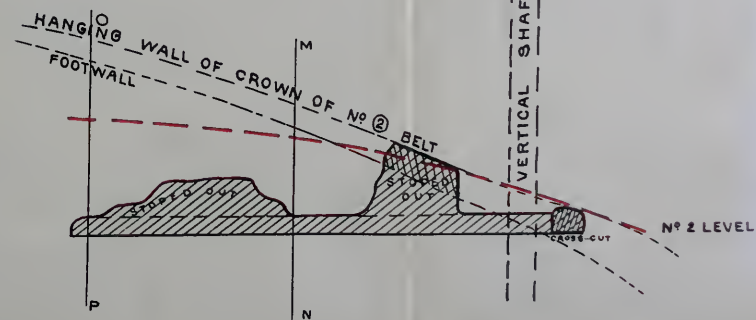


FIG. V.

"DEVELOPED" LONGITUDINAL SECTION
ON THE SOUTH LEG
MADE UP FROM FIGS. I. II. III. & IV
AND FORMING A "STOPE" OR "WORKING" PLAN.
RED DOTTED LINE SHOWS CORRECT POSITION OF TOP OF CROWN
IN RELATION TO LEVELS
IN EACH CASE



The underground plans have been brought up to date and new ones added during the year. As a rule the making of these plans is a comparatively simple matter, most of the workings lying practically in the same plane, and the most important part of the UNDERGROUND work consists in the making of careful measurements. In the case of such a mine with an inclined vein either a PLANS AND vertical projection of a longitudinal section on the vein or SURVEYS. a longitudinal section showing the workings in the plane of dip, in each case accompanied with a horizontal projection and transverse sections where required, will suffice.

But the question becomes a little more complicated in the case of workings on both sides or both sides and the end, of an anticlinal formation especially where two or more "saddle" belts are being worked by a vertical shaft or otherwise through the same opening.

The method described by the following plates is suggested as a simple and graphic means of accurately depicting such workings.

In all cases the departmental plans are required to be made on tracing linen, the linen to be considerably larger than the plotting so that it can be sent back from time to time to be brought up to date.

Figure I shows a tranverse section through such a vertical shaft as described, which in this case cuts *two* saddle belts on or near the "crown." It will be noticed that stations have been cut and cross-cuts driven at both levels, so that both belts may be worked through the same shaft. At No. 2 "mine" level it will be noticed that from the cross-cut No. 1 level has been driven on belt No. (2,) and No. 2 level has been driven on belt No. (1.)

Figures II and III are simply horizontal projections of mine levels Nos. 1 and 2 respectively.

Figure No. IV shows transverse sections on Figure II, while Figure V is a so-called "developed" longitudinal section on the south leg of No. 2 "mine" level.

This latter drawing, although a distorted view, will nevertheless be found a simple and efficient means of showing the superficial area of stoped and reserve ground. Figure V, in conjunction with Figure III., should give a very fair approximation of the cubic contents of stopes and reserves.

A cause of a great deal of trouble, dispute and lawsuit, often entailing the closing of valuable mines in the province, has been the inability of the department or anyone to define division or boundary lines of properties on the ground in many of the older districts.

The reasons for this are easy to find. Many of the old surveys, 20 or 30 years ago, were apparently made in a careless manner. Very often a small compass with an attachment known as a "Jacob's staff;"

an absolutely inefficient instrument for the work, even when the greatest care was taken was used and the measurements were almost invariably inaccurate.

Another source of errors would arise from surveys being made from independent starting points in the same district, and after the lapse of some years, the increasing number of claims based on each first "take-up" would overlap, and it would then be found that the same area "range" lines were widely divergent in direction. Again, even in districts where the lines were approximately correct, they have often been obliterated by fires and other causes.

For the past three years the Department has endeavoured in districts where such confusion exists, to gain the mutual agreement of all the lease holders to a departmental readjustment survey, and wherever this has been obtained a base-line has been laid down on the ground and marked with permanent monuments of the standard type which I designed at your request and which have been adopted by the Department. These have been established at the districts of Waverley, Uniacke, Brookfield, Molega, Vogler's Cove and Blockhouse.

The dimensions and method of placing these permanent survey marks are as follows :—

A hole is dug from $3\frac{1}{2}$ to 4 feet deep, and the wooden box or mould for the monument which is two feet square in inside sectional measurement and about $4\frac{1}{2}$ feet high, is placed in the hole with its corners as nearly as possible on the area lines.

The box is constructed of boards nailed on the inside of four legs made of scantling 2" x 3" in section, and $4\frac{1}{2}$ ft. long. The boards only extend from 2 ft. to $2\frac{1}{2}$ ft. from the top, and the box is fixed securely in this position by large stones, piled in the hole to a height of about 1 ft. to 1 ft. 6 in. from the bottom. A few large flat stones are also placed in the hole before the box is put in. The space inside and outside of the box is then filled with concrete composed of cement one part, to sand, gravel or sifted ashes about 3 to 5 parts. Broken stone is mixed with this up to within a short distance of the top, when pure cement is used. This makes a smooth surface and the area corner is marked by a $\frac{3}{8}$ in. spike being inserted with its head almost flush with the top, and its centre exactly over the intersection of the area lines.

The top is then graved across the centre with the intersecting area lines at right angles, and with the numbers of each of the four areas placed in the divisions. The accompanying sketches show the monument in course of erection, and when completed.

* This spike should be of brass and 8 inches would be better than 6 inches.

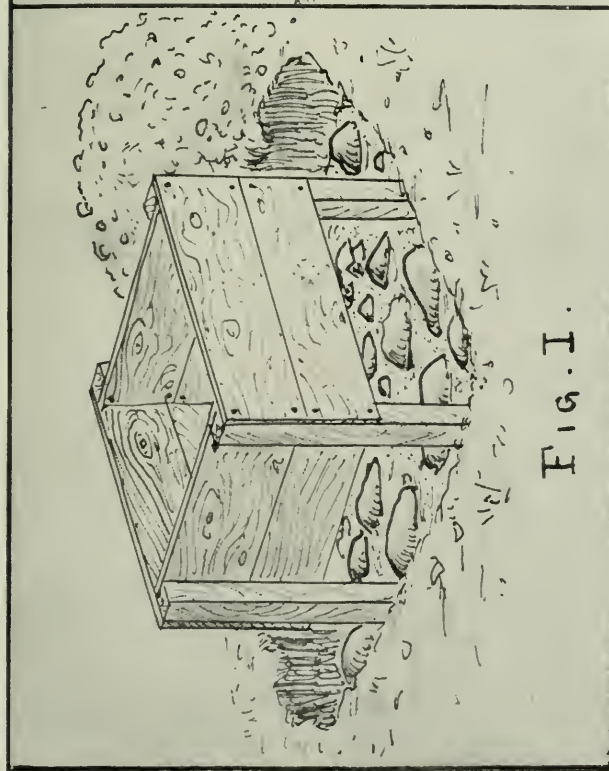


FIG. I.

FIG. I.—Showing Monument in Course of Construction.

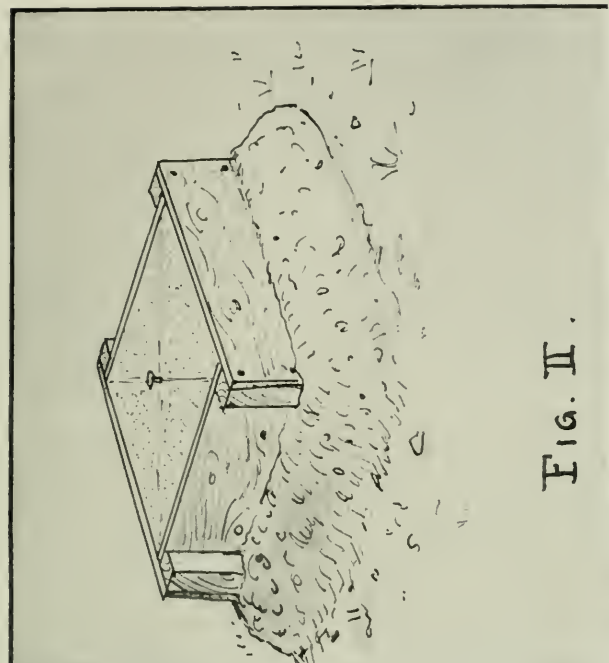


FIG. II.

FIG. II.—Showing Monument Completed.

Scale—2 feet to 1 inch.

D. W.

Clause 19, Rule 17, of the Metalliferous Mines Regulations Act, requires every hoist used for raising or lowering men in a mine to be equipped with an indicator as well as any other mark on the rope.

INDICA- TORS AND HOISTS.	As the shafts have become deeper and as so many more of them are vertical of late years, this method of entering and leaving the mines is the rule instead of by ladders as formerly.
--------------------------------	---

The clause has, therefore been enforced, and most of the mines employing this method have equipped their plant with either the dial or the horizontal sliding mark form of this machine.

Too much care cannot be exercised in having the most efficient form of brake on hoisting engines, and also in carrying out constant tests to prove its efficiency.

There is no more fearful accident at a metal mine, nor one that exerts a more distressing moral effect on the employes, and in fact on all connected therewith, than the death of men caused either by a runaway cage or skip, or by overwinding.

In line with the above the following paragraph from "Mines and Minerals" for the present year may prove interesting. It would probably be startling to know what the actual factor of safety of some of the ropes in use really is.

WEAKEST POINT OF A HOISTING ROPE.

"It has always been assumed that the weakest point in a hoisting rope is at the socket which joins it to the cage, and to compensate for this it is a common practice to periodically cut off a number of feet from this end of the rope and resocket it.

"Recent experiments in Germany seem to disprove this and to show that the weakest point is the point that is just in front of or on the drum when the cage is at the bottom. An account of these experiments appeared in an article by Mr. Speer in *Gluckauf* for July 16, in which the author gives a long table of tests for tensile strength of old hoisting ropes, made in the experimental station of the Westphalian Miners' Beneficial Association. The results make it appear as though the part of the hoisting rope, which is subjected to the greatest strain, is not, as most generally accepted, located at the lower end of the rope above the cage, but at that part which is in front of or on the rope drum, when the cage is at its lowest position, in so far as this place has to carry the whole weight of the rope besides the cage, the tubs and the hoisted load, and also this greatest possible load, has to be given an acceleration in starting. In some cases which came under the author's observation, the diameter of the ropes at this place had also more or less decreased. On the average the tensile strength of the rope at this place was 25 to 33 per cent. less than at the cage.

The author thinks that endeavors to decrease the legal requirement of a factor of safety of 6 when testing the lower end of the rope, should be resisted, inasmuch as with such a factor of 6 at the lower end, the factor of safety at the rope drum would only be from 4 to 4½.

"The experiments are being continued, and will be watched with interest, for if they confirm those already made it will be necessary to revise the common practice in regard to the inspection of hoisting ropes, and to take account of their decreased strength in testing rope calculations."

ACCIDENTS. I am happy to say that so far as can be ascertained the number of serious accidents did not appear to exceed the average of recent years.

GOLD. Progress has been made in saving the refractory por-
REDUCTION. tion of the gold contained in the tailings.

It is now about three years since the first commercial cyanide plant of any size was erected in the Province, and unfortunately, both that and the plant that succeeded it at Isaac's Harbour seemed to prove failures from a financial standpoint.

Since that time, however, a plant was erected at the mine of the Mic-Mac Mining Company at Leipsigate, (particulars of which were given in the last annual report) which has now been running profitably for over 18 months.

Almost a duplicate of this plant was recently installed under the supervision of Mr. H. S. Badger at Brookfield, and also appears to be commercially successful. Experiments are now being conducted at the "Boston-Richardson" mine at Isaac's Harbour, with the object of installing there a plant, which, as the mill contains 60 stamps, will doubtless be larger in capacity than the two last named, (which are of 75 tons and 50 tons capacity respectively, per 24 hours.)

It is highly probable that a large percentage of the mills in the Province could profitably erect small cyanide plants for the treatment of their tailings, which numerous assays covering a number of years have shown to be valuable.

There is one matter before proceeding to the detailed report to which I feel called upon to draw your attention, and one which of late years is doing an injury to the reputation of our mineral fields that may be lasting.

I refer to the methods of unscrupulous individuals and companies who carry on mining business entirely on paper, and publish with the boldest effrontery glowing but untruthful prospectus', which are distributed broadcast, not in this Province alone, but throughout many of the States. Of the hundreds of thousands of dollars that must be obtained by the sale of the generally worthless watered stock, probably not 10 per cent. actually finds its way into plant, equipment, or labour in this Province.

What little of these ill-gotten gains is spent here is usually wasted in attempts to make a display to assist in the sale of more stock.

DETAILED REPORT.

GUYSBORO COUNTY.

Goldboro.

Dolliver
Mountain G. J. Partington.....Manager.
Mining Dan. McAskill.....Foreman.
Company.

At present 36 men are employed.

This company is the first to take advantage of the Act passed last session in which the Government pays part of the cost of sinking a deep shaft, and on May 25th, work was commenced under conditions imposed by the Commissioner.

The following notes on this sinking will no doubt prove of interest, and will show the manner in which the work is being done.

On May 25th, 1904, the date from which the aid to the new sinking will apply, the shaft excavation had reached a
DEPTH AND depth of 330 feet.

DIMENSIONS This shaft measured in section in the rock about 21
OF SHAFT. feet x 10 feet and was timbered from the surface to a depth of 304 feet in the following manner:

The first 60 feet of sinking was quicksand, and a temporary cribwork was used in approaching the bed rock. When this was entered and the timbering proper (2 feet smaller all round in sectional area than the cribwork), was placed in position, the
TIMBERING. space between was tamped with clay and a drain having been cut around the rock, the heavy surface water was caught.

The square set system was used, the wall plates, ends plates, dividers and posts being framed out of 10 in. x 10 in. squared spruce and hemlock.

The frames are placed at distances apart of 4 feet 10 in. at centres.

At intervals of 50 feet to 60 feet hardwood "carriers" (10 in. x 10 in. in size) are "hitched" in the walls across the shaft. A 10 in. x 10 in. hardwood set is placed directly on top of these and
METHOD OF the timbering is then carried up in the regular manner.

PLACING. The shaft is lagged on the outside with 2 in. hemlock plank to a distance of 273 feet from the surface and from there down with 1½ inch plank.

The shaft measures inside plates 17 ft. 3½ in. x 5 ft. 3 in., and is divided into three compartments—two hoisting ways 5 ft. 3 in. x 4 ft. 9 in. and a ladder and pump compartment 6 ft. 1½ in. x 5 ft. 3 in.

In the latter compartment the supply and discharge pipes for pump, air pipes, etc., are divided off by a hand rail from the ladder road and solid platforms are placed at every 25 feet.

This compartment is divided from the hoistway next it by a casing of one and a half in. hemlock planks spiked on to the dividers.

In the hoisting compartments the guides for cages are of 4" x 5" Southern hard pine.

The hoisting, drilling and pumping plant and the power for it is installed, and the whole plant is of an efficient capacity to do the work necessary in sinking to 1000 feet.

PLANT. The power house contains the turbines and generators which transmit the power supplied from the dams (by nearly a mile of sluice and flume) electrically, to the engine house at the shaft, where are installed a large Lidgerwood double drum electric hoist and motor driving the low half of a Rand Drill Air Compressor.

PRESENT AND PROPOSED WORK.

*The new sinking was commenced on May 25th, 1904, and has since progressed at a rapid rate with the intention of proceeding at the quickest possible speed to a depth of 1000 feet.

On June 25th a depth of 60 feet had been gained below the level of May 25th and timbering was commenced. It is the proposed plan to sink 60 feet and then to timber 60 feet of this depth. The work is being done across the dip and (generally speaking) this appears, in the rock encountered, to be a safe distance to leave blank.

The plan of this timbering will be practically the same as was done in the first 300 feet of the shaft, with the exception that the timber used will be of 8" x 8" spruce instead of 10" x 10". The carriers however, are still to be 10" x 10" hardwood with 10" x 10" hardwood sets placed immediately on top of them. The sets in the new sinking are to be placed at distances apart of 4'8" at centres.

As stated, most of the surface water is prevented from entering the shaft. At the No. 1 station on the 160 feet level on the Partington belt, dams have been put in and the water is lifted by a Cameron steam pump to the surface.

PUMPING. Another and similar Cameron pump at No. 2 station, pumps from a lodgment there to No. 1 station.

*At 488 feet the sinking was temporarily stopped (by permission of the Department) for two months and a Sullivan drill put in the bottom to drill about 500 feet on the anticlinal axis—this drill producing a 2 in. core. The hole was reduced to one-half the size and on completion of the 500 ft. the sinking was suspended for the present.

A Northey pump is also installed at this No. 2 station, and is used on Sundays when the other pumps are idle.

The water in the bottom is at present light, and is *baled* to No. 2 station lodgment, and this method will continue to be employed until its increase necessitates a pump.

The arrangement of labor, etc., in this new sinking is as follows :

The work is divided into three shifts of 8 hours each. The first shift, consisting of three drill men and three helpers with three machines, go on at 4 o'clock. This shift drills all the
ARRANGE- holes, 26 in number, and fires the inside sink holes.
MENT OF Shift No. 2, consisting of four muckers, clean up the
LABOR, &c. shaft, fire the next lot of holes and clean up for the last shift, which is also made up of four muckers.

This shift fire the remaining holes and clean up the shaft for the first shift of drill men who come on again at 4 o'clock.

The amount of dynamite used in the shaft to date has
EXPLOSIVES. averaged about 23 lbs. per vertical foot of excavation. It is expected that this amount can be reduced to between 15 and 20 pounds per foot.

All other mining work is stopped while the sinking is in progress. Since last year the underground development has proceeded steadily and the levels, etc., have been extended as follows :

The shaft is 488 feet deep.

On the Partington Belt the No. 1 South level has been extended from 164 feet from the shaft station to a total distance of 645 feet. At a distance of 583 feet from the station an upraise was made on the belt and connected with the air shaft sunk from the surface on the belt. The dip of this shaft at 60 feet from surface was $53^{\circ} 30'$ and it measures from deck to level 158 feet.

The north leg has been extended from 150 to 204 feet from station. The ore has been stoped up from the levels on each side for distances of about 350 feet from the station on the south level and 175 feet on the north level.

The belt matter over the crown or saddle of the fold has, however, been to a great extent left in. At 110 feet in the north level a raise has been put up and connected over the apex with a raise from the south level driven at a distance of 151 feet from the station.

At 308 feet in the shaft a similar station to No. 1 has been cut on the Forge belt, and this belt has been drifted on south for 180 feet and north 194 feet. Very little stoping has been done on these levels. Near the face of the south level a fault throws the belt 18 feet to the south.

A cross-cut was driven from the station north 80 feet and south 125 feet, and connected with the Partington Belt. On the south side the belt was drifted on west 62 feet and east 74 feet, and from cross-cut and on the north leg the drifts are 50 feet west and 80 feet east.

SURFACE. No change of note has been made in the plant, though the new workshop has been completed.

**The Boston
Richardson
Company.**

H. PlayterManager.
John ThornhamForeman.

Two shifts comprising 66 men underground and on surface are employed.

As stated in my last report, after the cave-in in March, 1903, attention was solely directed to the enlarging and sinking of the vertical shaft commenced and sunk to a depth of 180 by the former company.

The new shaft measures 19 feet by 6 feet inside timbers and is divided into three compartments--two hoistways and a ladder and pump compartment.

The bed rock was not encountered until 30 feet of surface had been gone through.

This portion was close timbered with 12" x 12" timber and 6 inches of cement was placed round it. The water however, was found to come through and the joints were then caulked with hemp rope and a drain cut round at the surface of the bed rock. The rock here was cut away and solid concrete filled in around the shaft from the surface of the bed rock to a depth of 46 feet from the surface.

From here down the shaft timbering consists of square sets of 8" x 8" hemlock placed 3' 8" apart at centres.

Carriers of 12" x 22" spruce are hitched across the shaft at intervals of from 35 feet to 50 feet. The shaft is lagged with hemlock deal and the space outside is filled with broken rock.

Three shifts (8 hours each) of 6 men each, do the sinking. These are all drill men and drill, fire and clean out.

Three Sullivan machines are employed in sinking, and the shaft on the 1st of July had reached a depth of about 410 feet.

At 96 feet a drift was put in 45 feet east of the shaft and disclosed a large belt dipping to the south. A cross-cut was driven north from this drift and a small drift was put in east on a belt dipping nearly vertically, but with a slight northerly inclination.

Between this depth and 386 feet from surface the shaft intersected 8 veins ranging from 4 to 7½ inches in thickness. These I could not examine as the timbering of the shaft covered them but their positions and sizes were given me by the manager, Mr. Playter.

At 386 feet a gouge seam occurred apparently dipping north-eastly and below this considerable quartz was mixed through the rock. This ore is doubtless the extension of the *Richardson belt, and when a little more depth has been gained a cross-cut will be made to the legs.

On the surface a large and substantial shaft house was nearly completed with gallows frame 64 feet high. The hoisting sheaves are 6 feet in diameter and the building contains grizzlies, ore bins and the large Blake rock breaker formerly used by the old company. A duplicate of this machine will shortly be installed.

The engine used in the mill is being transferred here to operate the rock breakers and a Cornish pump.

This has been remodelled. The tops of the old timbers foundations have been blown off with dynamite and cement foundations 3 feet above the old timbers have been built under the mortars. A large Norwalk compressor is to be shortly installed.

Cochran Hill.

The California Gold Mining Company.	Geo. F. McNaughton	Manager
	J. Mason.....	Foreman

Little if any underground development has been done during the year, though the water was being kept out of the old works.

An old shaft some distance to the eastward is also being opened and retimbered.

Wine Harbor.

Plough Lead Mining Company.	M. McGrath	Manager.
	C. N. Robar.....	Foreman.

A force of 18 men is employed.

*Since the above report was written the cross-cut has been made to both legs on which levels have been driven and connection made with the old workings which were pumped out.

Stoping on the ore shoot has been carried an additional 60 feet east during the year, though the shaft has not been deepened. At the time of my visit work on this body had been stopped and mining was being prosecuted in the west shaft on the "Little South Lead," where stoping has been extended to a distance of 110 feet from the shaft easterly. This work has been done above the 60 ft. level, but a small block has been removed below the level. There still remains a block of ground 120 feet long and about 20 feet high to be taken out between the shafts. The belt rock above and below this is to be left in as pillars.

Only 5 stamps of the 15 in the mill were working at the time of my visit, the cam shaft having broken.

Old Provincial Mining Company.	S. R. Heakes.....	Manager.
	John Boland.....	Foreman.

There are forty men on the pay roll.

No work has been done during the year in the "Caledonia" workings which closed on July 2nd, 1903.

In the "Plough Lead Shaft," so called, the upper level at 284 feet is east of the shaft 42 feet and west 43 feet. At the west end of this level cross-cuts were driven north 52 feet and south 66 feet. No mining has been done here during the year, though dams have been put in. The water is pumped from the bottom to this lodgment and from here to the surface.

At the 352 feet level the cross-cut south is in 61 feet from the shaft and north 29 feet. The drift has been widened and is now in 50 feet and west 169 feet.

A block of stoping has been done below the drift on the west side. A cross-cut has been driven from the stope under this level north-easterly, below the shaft and a raise was made up to the shaft bottom.

This method of deepening the shaft was resorted to to prevent the very heavy water from interfering with the work. The shaft was also sunk below this cross-cut and is now at a depth of 400 feet from the deck. At the bottom a cross-cut south was driven for 30 feet and a drift west was in 15 feet. It is expected that this drift will intersect the top of the "Plough Belt" ore body on its eastern pitch.

It is supposed that the ore in the west end of the 352 ft. level belongs to this belt. The shaft in this mine is very wet, and the arrangement of the ladder, pump and manway is bad.

The plant is practically the same as last year.

Napier The workings opened over a year ago on the "Napier"
Workings. property by L. W. Getchell, have been kept unwatered
 and a little work has been done underground.

Goldenville.

Royal
Oak
Company. W. J. McIntosh.....Manager
 Gardiner McKenzie.....Foreman

Twenty-five men employed.

On the "Jumbo" belt between the 100 ft. level and the 200 ft. level the ore has been mined for 30 feet west of the shaft and the stope on the east side has been extended from a point on the 200 ft. level, a few feet from the shaft, up to a point about 45 ft. from the shaft in the 100 ft. level.

Below the 200 ft. level on the west side a small block was taken out close to the shaft.

The cross-cut on the 100 ft. level 30 ft. east of the shaft has been extended south for 175 feet from the level and has cut 5 belts not including the "Jumbo" belt. The largest of these contains about 7 inches of quartz.

All these belts have been driven on for short distances.

The inclined shaft has been deepened from 320 feet to 410 feet, and a small drift has been made west at the bottom for 30 feet. A cross-cut from this level connects with the Hayden belt.

The pit is unwatered by 3 pumps. Two Cornish pumps on the same line of rods, one at the bottom and one with suction in a lodgment in the 320 feet level west, lift to the 100 feet level where a Northey steam pump discharges to surface.

No new work has been done above the 200 feet level. This level has been extended a few feet west and the shaft has been
 ON THE "HAYDEN"
 BELT. deepened to 320 feet. From the bottom, the ground has been stoped down on the west side to a winze 50 feet deep which connects with the Jumbo lead at the bottom by the cross-cut above mentioned.

From this winze the ore is stoped up vertically to a point near the end of the 200 feet level. These workings are unwatered through the "Jumbo" pit.

For the second time in three years this old shaft which is 420 feet deep has been pumped out and at the time of my visit it was being rimbered and repaired. The 317 feet level is in east 50 feet. Near the bottom a level is in east 67 feet and west 117 feet. The ore is stoped from the end of the west drift up to the shaft at 317 feet.

At a distance of 300 feet east from this shaft a shaft called the old Zwicker shaft, was sunk a number of years ago on the same lead. This shaft is supposed to be 300 feet deep and as the extent of its workings are unknown, and as it is intended to follow up a pay-streak pitching toward it from the Gladstone works it is being pumped out. The water was down 140 feet at the time of my visit.

At the "North" belt, "McKenzie" belt and "German Big" lead, shafts are down on the dip; 53 feet, 128 feet and 70 feet respectively. From the "German Big" lead shaft drifts are in, west 35 feet and east 60 ft. In the "McKenzie" shaft at 60 feet deep drifts are in 53 feet east and 50 ft. west. and on the "North" belt a drift has been carried west 32 ft. In addition to the drifting short cross-cuts have been put in north on each of these belts.

At the Gladstone works a new return tubular boiler ("Truro" make,) has been installed and a 40 h. p. Jenckes hoist is to be put in at once. In the mill a Truro 125 h. p. engine has been added during the year. Otherwise the plant at the mine is the same.

Nova Scotia & Mexican Mining Company.

Geo. J. Troop, Jr.,.....Manager.
John Lawson.....Foreman.

Development both below and on the surface at this mine has proceeded rapidly during the year, although for several months during the winter the work was handicapped severely by want of coal. This lack of coal was also felt by the other mines in this district. Some details of the shaft sinking may be found interesting in comparing with similar work at other localities.

The first 18 feet of the sinking was in quicksand and was close timbered with 3 inch planks laid flat. The next 90 feet was protected with similar dimension stuff laid on edge. From here to the bottom, setts of 6 in. x 6 in. soft wood are placed at 5 ft. 6 in. intervals apart at centres.

The carriers are of 10 in. x 10 in. hardwood and an 8 in. x 8 in. hard wood sett is placed immediately on top of these.

The shaft, inside timbers, measures 14 ft. $1\frac{1}{2}$ in. x 4 ft. $8\frac{1}{2}$ in. and is divided into three main compartments, the ladderway being cased off from the pump rod and pipe compartments by a $2\frac{1}{2}$ inch plank division, down to the 160 ft. level. The dividers are made of 3 in. plank, and the hoisting compartments are lined with $1\frac{1}{4}$ in. plank. The space behind the timbers is filled with broken stone.

The method of excavating is as follows:—

Four drill men drill all the holes in one shift (10 hours.)

The second shift (also four men), then go on and “fire” and clean up. About 12 feet per week was done by this arrangement of labor.

As stated, the shaft has been deepened from 120 feet to 260 feet.

At 160 feet a cross-cut was driven across the measures north 206 feet and south 307 feet.

UNDER-
GROUND
DEVELOP-
MENT. At 70 feet north of the shaft a small lead in a slate belt (supposed to be the “North Palmerston” lead) was driven on for 15 ft. east of the cross-cut. The slate in this belt is contorted in regular corrugations which pitch westerly at about 30 degrees.

The quartz for the short distance exposed showed gold freely. Three other veins were crossed in this north cross-cut at 98 feet, 115 feet, and 146 feet from the shaft, respectively.

The last of these (probably the “Mayflower Belt”) was drifted on east 225 feet and west 97 feet. At the face of this west drift a heavy feeder of water was encountered, probably coming in from the open cut from the surface on this belt.

In the cross-cut south of the shaft three belts were intersected, the “Tributer” vein at 54 feet from the shaft, the “Stuart” belt (19 feet wide) at 72 feet and the “Hard” belt at 97 feet. The first of these was drifted on east for 15 feet, and the whole width of the “Stuart” belt was opened east 48 feet, and west 28 feet. A narrow drift was continued on the south side of this belt for 115 feet east of the cross-cut. A test was also taken out of the “Hard” belt for a few feet on the east side.

At 260 feet another cross-cut was driven from the shaft for 110 feet south.

On the surface an addition has been made to the shaft-house by which the ore and rock floors and dumping arrangements have been improved.

MILL. A new 40 stamp mill is being built just south of the shaft-house.

The batteries are to be placed back to back, 20 stamps facing each way.

The mortar foundations are built of concrete made in the following proportions :—

Sand, $2\frac{1}{2}$ parts.

Cement, 1 part.

Broken stone, $4\frac{1}{2}$ parts.

This is solid down to bed rock about 15 feet below the mortar flange. The sides have a batter of 1 in 12.

No other changes have been made in the plant, though the installation of the 6 drill Rand Compressor has been completed and it apparently gives good satisfaction.

G. Hirsch- George Hirschfield has been doing some prospecting at
field's Pro- the extreme western end of the district, and expects
perty. shortly to commence tribute work on the N. S. & Mexican
 Company's property.

**Gold Mining
 Bluenose
 Company.***

A. G. McNaughton.....Manager.
 S. Monk.....Foreman.

Little work was done during the winter, fuel being scarce, and at the time of my visit the mine was idle, although it was being kept unwatered

Since last season work was confined to the section below the 252 ft. level on the "McNaughton" belt. The 340 ft. level has been extended west a distance of 75 feet, making its total distance west of the cross-cut now 439 feet. Stopping from near the west face of this level has been carried up to a point within 93 feet of the west face of the level above. The east face of this level is 221 feet east of the cross-cut and the raise at this face has been connected with the stopping above and a pillar 28 ft. long by 21 ft. high has been left behind this raise above the shaft.

A block of ore 387 feet long by 12 feet deep has been removed below this level by the underhand method and at the connection of the raises from the 440 ft. level it has been stoped down to a depth of 40 feet from the level. A pillar however, has been left 125 ft. long by 45 feet high between these raises.

*Since the date of above examination this mine has been allowed to fill with water.

The 440 foot or lowest level is now 220 ft. west of the cross-cut and 84 ft. east. A small pillar 25 ft. long by 18 ft. high has been left above the cross-cut and the ore above the level has been stoped up to the raises from both faces by back stoping. The company has a few men employed in prospecting on the surface.

HALIFAX CO.

Miller's Lake.

About one mile to the north of where Messrs. Ashton and Brownell were working a few years ago, a new district has recently been opened and considerable surface prospecting done. Messrs. McMann and Fancy are working about $\frac{1}{2}$ a mile west of Miller's Lake so-called and at a point some distance east of the lake, and apparently on the same anticlinal on which the above works are situated, and upon which Mr. Boak and others are mining.

Harrigan Cove.

W. Boak and others have continued their work in the vertical shaft situated almost on the "crown" of the anticlinal axis.

It is now 84 feet deep and has intersected 13 quartz veins on the "saddle." The largest of these is $3\frac{1}{2}$ feet thick and the series form a beautiful exposition of the anticlinal structure.

I have been informed that since my visit the shaft has been deepened to 100 feet and cross-cuts have been driven north and south cutting the legs of the several veins on their north and south dips.

A small hoist and boiler comprise the plant.

F. Horn is foreman, and four men are employed.

Kent	
Archibald's	Munroe Archibald.....Manager.
Property.	J. Fraser.....Foreman.

The working staff includes 22 men working one 10 hour shift.

The east shaft which last year was 110 feet deep has now reached a depth of 220 feet.

On the east side of this shaft a block of ore has been stoped out, the face of which extends from the face of the 50 ft. level 50 ft. east of the shaft down to the face of the bottom level 10 feet east of the shaft.

On the west side of the shaft a large block of ore has been removed and the floor of this excavation slopes up from the shaft bottom for about 70 feet or more to a point about 200 feet from the surface, and from here the roof slopes up towards the shaft where it joins the old stoping at a depth of about 100 feet from surface.

On the 70 ft. level about 10 feet west of the east shaft, a cross-cut has been driven south and has cut three belts as follows:—

At 12 feet from the level a 7 foot slate belt containing a small percentage of quartz, and at 54 feet from level a small belt of slate and quartz. (This belt contains about 3 in. of quartz and has been drifted on east 48 ft. and west 18 ft.)

At 69 feet a slate belt containing 3 veins aggregating about 6 in. of quartz.

This latter belt has been drifted on east 15 feet and west 10 feet.

At a depth of 50 feet, and on the west side of the west shaft a cross-tunnel has been cut to a belt 24 feet wide, and a vein has been drifted on east of the cross-cut 15 feet and west 40 feet. This vein measures from 3 inches to 6 inches in thickness.

On the surface a new boiler and steam hoist have been installed.

Caribou.

Baltimore and N. S. Mg. Co.	L. W. Getchell.....	Manager.
	Otto Collings.....	Assistant.
	Stephen C. Thomas.....	Underground Foreman.
	Fred D. Darragh.....	Surface Foreman.

About 60 men are employed.

The lowest underground workings of this mine are now at a vertical depth of over 1000 feet from the surface.

The following is a summary of the work done during the year:

No work has been done above the 500 ft. level during the year nor has the level been extended in either direction.

No. 3 (700 ft.) level. West of the shaft the stoping has been extended west to the raise put up for the auxiliary hoist, at the face of the level, which means that practically all the ore is out down to this point west of the shaft.

This level east of the shaft has remained idle during the year.

The cross-cut has been extended nearly 900 ft. south of the level and several belts have been intersected.

Below the level the Winze has been sunk to a depth of nearly 325 feet.

No. 1 "Winze" level. This level has been driven east 192 feet and west 65 feet at a depth of 120 feet in the Winze. The ore has been stoped up to the Winze from each face of the level.

No. 2 "Winze level" at the bottom of Winze (225 feet below the 700 foot level,) has been driven east 30 feet and west 75 feet. The ore from the west face has been stoped back to the Winze, and about half the ore between this level and the one above has been removed. No stoping has been done on the east side.

The overhand or backstopping method is that employed in breaking the rock throughout the mine.

In these lower levels a somewhat new system of timbering is being employed. In the level sets the sills are 16 inches in diameter, and are laid lengthwise with the levels, under the three rows of posts which are 12 to 14 inches in diameter and about 7 feet high. The caps are also 12 to 14 inches in diameter and are placed on the posts across the level. Spraggs are used between the caps and heavy lagging poles 6 to 8 inches in diameter are placed across them.

As many sets (4 feet between posts) as will fit in across the level are used and the sets are placed four feet apart. As the ore is removed above the level sets the space is filled in with waste rock, which if necessary is taken from the walls. When within about 20 feet of the level above, a series of these sets are carried up and the sills of the upper level sets are caught on the cap of the set below.

The timber tram-way has been completed and a light locomotive has been running for several months.

Moose River.

Touquoy	R. Kaulbach,	Manager.
Gold Mfg. Co.	J. Fleming.....	Foreman.

The old workings have been practically abandoned and a new vertical shaft has been sunk 109 feet west of the "Doull" or No. 3 shaft. This new shaft is divided into three compartments. The plate timbers used in the sets are 8"x8" and the dividers are 5 feet apart. The posts between sets vary from 3 ft. 6 in. to 5 ft. height.

Hangers are used in carrying down the lower set work and the frames above are blocked, and wedged, and spiling is driven behind

The shaft which is being sunk to tap the extension of the slate fissure on its western pitch, had reached a depth of 145 feet, and sinking was still in progress.

At 122 feet from surface a cross-cut has been driven south and three belts of ore were intersected.

G. & K. This company have practically completed a 40 stamp **Company**. mill and are sinking a shaft on a lead near the mill. This has reached a depth of 90 feet. The company are also removing the surface material near the mill preparatory to making a test of its value.

The operations are being conducted on the old Colonial property which has been acquired by the company.

V. Crowe is foreman in charge of these operations.

Oldham.

Sterling	John Forster.....	Manager
Gold Mfg.	J. Canfield.....	Foreman
Co		

The mine is worked on double shift and 15 men are employed.

The boiler and engine houses which were burned in August, 1903, have been replaced by a new shaft-house, engine house and forge under one roof. A boiler, small hoist and a Rand Compressor comprise the surface plant and the mining is done by machine drills, of which the company have three. The main incline has been extended during the year, and is now 550 feet deep.

The fault on its north side beyond which the lead was lost appears to be diverging at the bottom, and thus more ground may be worked the deeper the incline is carried. At present, the face at the bottom is about 50 feet long.

It is the intention when a little more depth has been gained, to drive in south at the bottom and to work out the lead by back stoping. The ore has so far proved to be very rich, 214 tons producing 498 ounces during the year.

HANTS CO.

Renfrew.

**Pictou Develop-
ment Co.**

Mr. John Morrison is still working the property secured by him from E. Thompson et al.
The main shaft has reached a depth of 365 feet.

The stoping has been carried from near the shaft bottom by the underhand method up to the fault 75 feet east of the shaft.

A new boiler of 60 h. p. has been installed. A Cornish pump lifts from the bottom to the 200 ft. level and from here a Northey with 3 inch suction and the same discharge, lifts to the surface.

The No. 2 shaft on the 12 inch lead south of the Jubilee works has been deepened from 90 feet to 155 feet and at 80 feet a drift has been put in for a short distance east to a fault apparently parallel with the shaft.

The intention is now to drift east at the bottom.

The lead is smaller at the fault and at the bottom than it measured in the faces at my last visit. A small 15 h. p. boiler and hoisting engine have been added to the equipment and a Northey steam pump at 60 feet from surface handles the surface water caught in a dam from the upper workings.

Central Rawdon.

Central Rawdon
Consolidated
Mines, Ltd.

Dr. Cain.....Manager.
J. Hopkins.....Foreman.

About twelve men are employed on double shift. Several years ago a tunnel was commenced at the foot of the hill to intersect the fissure vein which had been worked previously and proved to be rich.

The extension of this tunnel which was 450 feet long was commenced on May 2nd, 1904, and by the end of September had reached the vein at a distance of 926 feet from the mouth. The shaft was pumped out and proved to be 107 feet deep and a survey showed that a raise of about 90 feet would be necessary to connect.

With this intention a drift is being made south on the vein for 25 feet when the raise will be commenced. At the point where the tunnel intersected the vein it appeared to be small. The shaft dips at about 50° to the east.

The plant includes a boiler and a small straight line Rand Compressor. A McKiernan machine drill ($2\frac{1}{4}$ " cylinder) was used in driving the tunnel.

West Gore.

Dominion
Antimony
Company.

W. J. Prisk.....Manager.
S. Aldred.....Foreman.

The men employed number 31.

Work has progressed rapidly since the last report was made on this mine, and the development shows the following extensions in the shaft, levels, stopping, etc.

No. 3 level at 406 feet from deck has been driven easterly 342 feet from the shaft. Ore was found for 180 feet from the shaft and was stoped on up to the level above. The remainder of the level lay in barren ground apparently above the top of the ore shoot which pitches east at about 45° or 50° from the horizontal. At 244 feet a cross-cut was driven north 17 feet, and at 340 feet another cross-cut is in 100 feet south. These two cross-cuts as well as other development work in the walls show that the slates on the north side have a north and south strike with an easterly dip, while on the south side the rock, which is also slate, strikes in a north-east and south-west direction and dips south-easterly.

On the west side of the shaft this level is in 60 feet and still driving. A small block of ore was stoped above the level near the shaft

The shaft has been sunk to a depth of 525 feet, and at 516 feet. No. 4 level has been driven east 240 feet and west 193 feet. In one place the ore runs up to 4 feet in thickness and for a considerable distance averages about 18 inches. At the east face the ore is thin and apparently approaching the top of the shoot. Two small blocks have been stoped above this east level.

The *bottom* of this ore shoot or chimney is not so well defined, but it appears to intersect No. 4 level a short distance west of the shaft. This level has however, been driven west for 193 feet and after cutting barren ground for some 150 feet or more, a small vein appeared at the face. A raise was driven at 165 feet from the shaft for 30 or 40 feet and drifts made each way—east 45 feet and west 40 feet. At each end of this intermediate level short cross-cuts were put into the north wall and tapped a small vein at the east end and mixed ore and slate at the west end. The belt was mined between this level and No. 3 for some 50 feet from the shaft and ore showed in the west face of the stope.

There is some talk of sinking a vertical shaft several hundred feet east to intersect the extension of the ore at 600 or 700 feet.

As stated before this ore shows high values both in gold and metallic antimony as well as appreciable values in silver.

It is understood that considerable work has gone on during the year with regard to the double metallic reduction of the ore, and as to its adaptability to use as colouring pigments and for other industrial purposes.

Two McKiernan drills (baby pattern) are used in driving and stoping, while a No. 5 Cameron pump and another steam pump (6"x4"x6") unwater the mine.

The compressor has been installed during the year and it is the intention to instal a new hoist to replace the Cooper Mfg. Co.'s machine now in use.

A manager's house is in course of erection.

Mount Uniacke.

Westlake	J. A. Crease.....	Manager.
Mining Co.	D. Patriquin.....	Foreman.

Ten men employed, 4 on surface and 6 below ground.

No change has been made in the plant.

The incline on the ore shoot has been extended to a total distance of over 200 feet from the shaft.

If reference will be made to the plate published by the Geological Survey showing a section across these workings, it will be seen that several *probable* folds are shown, causing similar "rolls" or shoots to that being worked at present.

With the expectation of intersecting one of these folds the shaft was sunk an additional 70 feet and a cross-cut run north 15 feet.

The main roll measures roughly at the present face about 30 feet in height and $4\frac{1}{2}$ feet in width and dips north at 50° . The ore pitches east at about 19° .

J. A. Johnson's	C. Johnson.....	Manager.
Property.	Dimock.....	Foreman.

Four men are employed. The shaft has been deepened to 300 ft. and sinking is still in progress. A small roll was intersected at about 200 feet and driven on for a few feet east, in which direction it appears to pitch. It is anticipated that a roll similar to that being worked by the Westlake Company on the Borden lead will be intersected.

A steam drill is used in the sinking.

South Uniacke.

Victoria	P. R. Curtis.....	Manager
Mining	John Kenty.....	Foreman, and 34 men employed
Co.		

The 200 feet level has been extended west from 150 feet to 222 feet, and the stoping has been carried to the face.

No work was done on the 300 feet level.

On the 400 feet level drifting has been carried west from 113 feet to 301 feet, and east from 130 feet to 243 feet.

The ore has been stoped from each face up to the shaft at a point a short distance below the 300 foot level.

The shaft has not been sunk any deeper since last year.

There is talk of installing a new boiler and compressor.

QUEENS CO.

Brookfield.

North Brook- field Gold Mining Co.	Noble Crowe.....	Manager.
	Steele Crowe.....	Foreman.

26 men employed.

This mine which has remained idle and full of water for several years was secured by the above named company, and unwatered in June, 1904.

Three shafts have been sunk on the belt which is apparently a fissure.

The west shaft is 235 feet deep and is 60 ft. west of the middle shaft, which is 300 feet deep and is used as the main working shaft at present.

The east shaft is 205 feet deep and is 75 feet east of the main or middle shaft.

At 235 feet in the main shaft a level on the belt connects with the west shaft and extends west of it 185 feet. A small block of ore has been taken out above this level, and west of the west shaft.

All the belt has been removed above this level and between the middle and west shafts, and the ore between the east and middle shafts has been stoped above a line from near the bottom of the east shaft to a point in the middle shaft about 160 feet from surface.

A comparatively small block of ore has been mined on the east side of the east shaft.

At the bottom of the main shaft a level has been driven east 467 feet and stoping is being carried on above it. The pitch of the ore appears to be easterly so far as can be judged by the present work.

A steam pump at the bottom of the main shaft lifts to a point 117 feet from surface where another steam pump is installed. Both these machines are of the Northey make. A small compressor supplies air for the Rand air drills (Slugger pattern). A boiler supplies steam for the compressor pumps and a hoist.

A 20 stamp crusher on the property completes the plant.

Brookfield	W. L. Libbey.....	Manager.
Gold Min-	Stanley Cole.....	Foreman.
ing Co.		

Mining has been carried on during the year below level No. 10 and the levels below this have been extended west of the incline as follows:—

No. 11 is in 478 feet.

No. 12 “ 443 “

No. 13 “ 486 “

No. 14 “ 174 “

Practically all the available ore above and between these levels as far as they have been extended has been removed with the exception of the ground between levels Nos. 13 and 14, about half of which has yet to be mined.

The incline has reached a distance on the slope of over 1000 feet from the deck and the intention is to still further prosecute the sinking.

In these lower levels several “main” leads have been intersected, which apparently correspond with some of those cut above.

No mining, however, has been done on these, though tests have been taken out in one or two cases. During the spring a 75 ton capacity Cyanide plant has been installed at this mine and has been working since May on the old tailings, beds, and on stock from the mill.

The remaining plant has not undergone any change of importance.

Fifteen Mile Brook — Molega

Have remained idle during the year, though in the latter district an agitation is on foot to obtain the Government aid to a deep shaft. Partly with this object in view the Geological Survey conducted a survey here under Mr. Faribault's supervision during the past summer.

Whiteburn.

At intervals returns have been made from lease 318 in this district the aggregate totalling 77 oz. gold from 190 tons of quartz. This was chiefly produced by work during the past summer when a few men were employed under the direction of Geo. Gannon.

LUNENBURG COUNTY.

Vogler's Cove.

Vogler's Cove
Mining Com-
pany.

A. B. Stewart.....Manager
J. Cameron.....Foreman

Six men employed.

Negotiations which have been pending for a considerable time were closed during the summer, and the property passed into the hands of the above company.

The original small surface plant is in use, though the manager stated that it was to be at once replaced by a larger and more modern equipment.

The north shaft is 125 feet deep and a drift on the belt is in 30 feet south at the bottom.

At the time of my visit the mine was filled with water up to the 90 foot level, which is in north 40 feet, and south 60 feet.

The belt, which is apparently a fissure, contains in the face of the north drift 9 feet of quartz. This narrows to 2 feet at the shaft and appears to split in the south drift into two veins 18 inches and 2 feet wide respectively.

The south shaft 30 feet from the north shaft is about 70 feet deep and a drift has been made 35 feet south from the bottom.

Leipsigate.

Mic-Mac
Mining
Co.

T. Moore.....Manager.
Chas. Hudson.....Foreman.

Forty-five men are employed on both shifts.

Most of the measurements given in previous reports and which were supplied by the management were approximate, but the actual depths and distances, etc., as taken from the official mine plan dated July 1904, and roughly checked by examination, are as follows:

	Depth from Surface.	Distance. N. E. from Shaft.	Distance. S. W. from Shaft.
No. 1 Level	154	195	
" 2 "	198	352	430
" 3 "	285	357	430
" 4 "	368	77	65
Shaft bottom	408		

Above No. 2 level (S. W.) the stoping has been extended to the end of the level.

Above No. 3 level (S. W.) the stoping has also been carried to the end of the level, though considerable ore is still to be mined above this level.

On the N. E. side of shaft, stoping has been carried up to the level above and to a distance of 187 feet from the shaft.

At 310 feet a raise has been put up to connect with the level above.

At the present face of No. 4 level N. E., a raise has been made 40 feet and a drift is in N. E. 60 feet.

The repair work in the shaft which was being done last year, caused a delay in mining but has now been completed and a new $1\frac{1}{2}$ ton skip has been installed.

Besides the Mumford 100 H. P. boiler put in last year, an 80 H. P. return tubular boiler has been added. Preparations are under way to add five stamps to the 10 now in the mill.

Two large water tanks have been constructed outside the shaft-house, into which the pit water is pumped, and after settling is used for all purposes at the plant.

The Cyanide plant has been running successfully during the year, and the sand beds have been about exhausted. Stock from the plates is used now, and this will be augmented when the new stamps are running.

A neat and artistic manager's dwelling has been erected.

I remain,

Yours obediently,

D'ARCY WEATHERBE, C. E.,

Mines Department.

The following inspection notes by Mr. D. Weatherbe and miscellaneous memoranda will show the progress in the mining of Iron and Copper ores, etc., during the year.

IRON.

Londonderry.

Londonderry
Iron &
Mining Co.

During the year considerable progress has been made both in the mines, on the surface and in the smelting plant.

The following details will give an idea of the work done at the several mines.

**OLD MOUNTAIN
WORKINGS.**

Three separate tunnels, Nos. 1, 2 and 3 are being worked here.

Messrs. Stevens, Esau and Seymour, foremen, and 65 men employed.

From these workings a connecting drift is being run to meet a tunnel being driven from the east side of Cook's Brook.

**COOK'S BROOK
WORKINGS.**

The mouth of these workings is nearly a mile west from the "Old Mountain" mines.

John Newhook is foreman and 33 men are employed.

Thirty-two hundred feet of driving and 200 feet of sinking have been done here during the year.

MARTIN'S BROOK. A severe crush occurred in No. 7 adit level several hundred feet from its mouth. To overcome this obstruction a branch tunnel was started to go round this bad ground.

The rock here is composed of soft argillaceous shales and dips southerly at about 35 degrees. It becomes extremely friable and shaky when exposed to the air. To support the roof very heavy timber was placed in this level. Severe rain storms in April last caused the roof to cave from the surface, and as the workings beyond the crush were filled with water, it was decided to pump them out from No. 6 adit level.

Accordingly a pump and compressor were installed there and the work of unwatering commenced.

This was, however, abandoned shortly afterwards.

The adit level on the east side of Martin's Brook was also driven a considerable distance with the idea of eventually connecting with the Cook's Brook workings, some 3000 feet to the eastward.

**CUMBERLAND
BROOK
WORKINGS.**

The Cumberland Brook Workings, including the Martin's Brook Workings with which they are connected, form the most extensive continuous metal workings in the province and extend east of the Brook for a distance of nearly 5,000 feet, and west of the Brook for some 1200 feet.

George Farman is foreman and has 32 men under him.

On the east side the work of cleaning out and re-entering the slope and bottom levels progressed rapidly until August 20th, when heavy rains flooded the mine and drowned out the pumps.

Unwatering has since been going on steadily, and the first pump had been reached at the time of my visit.

On the west side of the Brook a new level was driven 70 feet below the old one to connect with winze sunk from the upper level and apparently on the same ore body which dips southerly.

A large quantity of ore was stoped from between these levels.

Between Martin's Brook and Cumberland Brook, some tributaries are taking out a small quantity of surface ore of a superior quality from the top of the hill.

EAST Several open cuts and quarry workings are being
MINES. operated here about $5\frac{1}{2}$ miles east of the Folly River.

Leonard Slack is foreman and has some 30 men employed.

Between the east mines and the furnaces at Folly River, several workings have been and are being operated. These include, taking them in order, going west; "Rodgers'" "McSwain's Brook," "Ferguson's Level," "Henderson's" and "Drummond level."

Particulars of output and labour at each are given in the table at the end.

The furnace was first blown in on Jan. 8th, 1904, and since then smelting has been going on regularly, 13,585 tons of pig having been produced.

The batteries of coke ovens have been augmented until 100 are at present in use.

SUMMARY STATEMENT.

The following table gives details of work and output at Londonderry Iron mines from reopening of mines in 1903 to September 1st, 1904.

NAME OF WORKING.	Feet Drifted.	Feet Sunk.	No. of Men Employed.	*Tons of Ore Produced.	
				Black Ore.	Ankerite.
East Mines.....	1060	.....	30	5125	5130
Rodger's.....	100	.....	2	100	.....
McSwain's Brook.....	300	.....	3	100	.....
Ferguson's Level.....	80	.....	3	377	222
Drummond.....	250	.....	3	.....	.....
Old Mountain.....	2925	200	65	13903	7503
†Cook's Brook.....	4025	200	33	12048	196
Martin's Brook.....	.....	.....	10 }	4064	851
Cumberland Brook.....	1050	.....	35 }	.....	.....
Total.....	9790	400	184	35717	13902

*For convenience the ores are divided into Ankerite; (the Carbonate) and all the other ores, classed together under the head of "Black Ore." This latter includes the various Limonites "Paint" ore and a small proportion of Hematite.

†Including levels Nos. 6 and 7—and 6, L. I. M.

Torbrook.

This mine which has lain idle for upwards of a year was reopened in September, 1904, when unwatering commenced. It is understood that the Londonderry Iron and Mining Co., are the operators.

OTHER IRON ORES, ETC.

NOTES FROM GEO. SURVEY DEPARTMENT.

The following partial analyses of iron ores, etc., were all conducted by Mr. F. G. Wait.

1. **MAGNETITE.**—From the farm of John Hatley, Cleveland, Annapolis County, Province of Nova Scotia. This and the three following specimens were examined for Mr. Geo. E. Corbitt.

A fine-grained massive magnetite. It was found to contain metallic iron 44.13 per cent., insoluble siliceous matter 32.85, titanium dioxide, none.

2. **MAGNETITE.**—From Baker's farm, pit No. 1, Nictaux iron mines, Annapolis County, Province of Nova Scotia.

A fine grained massive magnetite. It contained metallic iron 53.61 per cent. insoluble siliceous matter, 12.89, titanium dioxide, none.

3. **MAGNETITE.**—From McConnell's farm, pit No. 2, Nictaux iron mines, Annapolis County, province of Nova Scotia.

A fine grained massive magnetite, which was found to contain metallic iron 55.45 per cent., insoluble siliceous matter 13.03, titanium dioxide, none.

4. **MAGNETITE.**—Also from McConnell's farm, but from a different opening, namely pit No. 4.

A fine grained massive magnetite. Determinations gave metallic iron 55.69 per cent., insoluble siliceous matter 15.18, titanium dioxide, none.

3. Water from a spring on the farm of Angus Cameron, on the west side of Margaree River, about a mile and a half below Scotsville, Inverness County, Province of Nova Scotia, examined for Mr. J. H. Cameron.

The sample of water received for examination contained a trifling quantity of white, flocculent organic matter in suspension. This was removed by filtration. The filtered water was clear, bright and had a faint brownish-yellow colour. It was odourless, had a mildly saline taste, and reacted neutral, both before and after concentration. Its specific gravity at 15' 5° C., was found to be 1002.6. The total dissolved

saline matter dried at 180° C., amounted to 4.50 parts per 1000, equivalent to 315.7 grains per imperial gallon.

A qualitative analysis by Mr. Wait, showed it to contain :

Potassa—Very small quantity.

Soda—Somewhat large quantity.

Lime—Rather small quantity.

Magnesia—Very small quantity.

Sulphuric anhydride—Rather small quantity.

Carbonic anhydride—Small quantity.

Chlorine—Somewhat large quantity.

Silica—Trace.

Organic matter—Faint trace.

Boiling produced a slight precipitate, consisting essentially of calcium carbonate with a very little magnesium carbonate.

4. Water from a well in the town of Lunenburg, Lunenburg County, Province of Nova Scotia.

This, when received, contained a trifling quantity of white, flocculent, organic matter in suspension, which, having been removed by filtration, left the water, clear, bright and apparently colourless, although when viewed in a column two feet in length it was found to have a faint brownish-yellow colouration. It was odourless, devoid of any marked taste, and reacted neutral both before and after concentration.

The total dissolved saline matter dried at 180° C., amounted to 0.26 parts per 1000, which would be equivalent to 18.2 grains per imperial gallon.

A qualitative analysis by Mr. Wait, indicated the presence of :

Soda—Very small.

Ammonia—Trace.

Lime—Small quantity.

Magnesia—Very small quantity.

Ferrous oxide—Trace.

Sulphuric anhydride—Very small quantity.

Carbonic anhydride—Small quantity.

Chlorine—Very small quantity.

Silica—Trace.

Organic matter—Very small quantity.

Boiling produced a slight precipitate, consisting of calcium carbonate with a very little magnesium carbonate.

COPPER.

Colonial	J. A. Hanway.....	General Manager.
Copper Co.	S. M. Archibald.....	Superintendent.
	R. Cameron.....	Foreman.

About 42 men on surface and underground.

No. 1 level has been extended north of the north incline 50 feet and a cross-cut made from this point east for 30 feet.

Four cross-cuts have been made west from the No. 2 level for distances of 30, 50, 47 and 66 feet respectively.

At 32 feet in the latter cross-cut the winze which was 66 feet last year is now 200 feet. At 80 feet in the winze No. 3 level is driven north 55 feet and south 15 feet and from the south drift a cross-cut is in west 12 feet and east 30 feet.

At 170 feet a cross-cut is in west 12 feet.

At the bottom of the winze a cross-cut is in 12 feet west and No. 5 level has been started south and driven north 50 feet, where it is connected by a short cross-cut with an incline which has been sunk south from the point where the main north incline meets No. 2 level. This incline is now 475 feet from No. 2 level, and is still being deepened. At 275 feet in the incline cross-cuts have been driven east 18 feet and west for an equal distance.

In the mill the classifier and concentrator have been removed and three jigs have been added to the three which were installed last year. Three more are to be added shortly.

CARBONACEOUS SHALE.

FROM GEO. SURVEY DEPT.

The material in question, and which has, indifferently, by some, been referred to as "bituminous shale," by others as "coal," and yet others, as "anthracite," is found about a mile up Harris brook a tributary of Baddeck River, or some four and a half miles west by north of the town of Baddeck, in the district known as Hunter's Mountain, Victoria County, Province of Nova Scotia, where it occurs associated with the Carboniferous conglomerate.

The surface of the freshly fractured shale is dull and earthy and of a grayish-black colour, that of what would appear to be bedding planes as likewise that of jointage planes, however, is velvet-black, smooth and lustrous. It does not soil the fingers.

An analysis, by fast coking, gave as follows:—

Hygroscopic water.....	1.18
Volatile combustible matter.....	14.73
Fixed carbon.....	28.45
Ash	55.64

It yields by fast coking, and that notwithstanding the large amount of ash, a coherent, but very tender coke. Colour of the ash, very light reddish-brown.

The occurrence of a very similar material, to that above described, at Hunter's Mountain, has been referred to by Mr. Hugh Fletcher, in his report on the geology of that part of Cape Breton Island—see Report of Progress of this survey for 1876-77, p. 454. Mr. H. S. Poole, also in his report on the inspection of mines in Nova Scotia, for the year 1877, refers to the occurrence of a bituminous shale, by courtesy called coal, at this place, and in so doing, states that material of similar character has been exposed on the flanks of several hills in the province, but nowhere has its quality improved in depth to warrant its extraction, even were it more favourably situated for working. Nor does this spot, namely—Hunter's Mountain—hold out any better inducements.

BORING MACHINES

DR. E. GILPIN,

Deputy Commissioner of Public Works and Mines:

SIR,—In submitting the following report on the progress for the year I beg to call attention to the appendix to the Mines Report wherein is contained information regarding the operation of the Government drills which, if referred to by enquirers, may save much needless correspondence.

This portion of the report has also been published in manual form of a size and shape convenient for the pocket.

As usual, will be found appended the itinerary table and detailed reports with notes thereon, on the work of each machine, also a summary statement showing the year's work in tabular form.

During the season a new and more comprehensive system of record forms has been established which refers to both boring and cost records. The forms are issued to the drill men who return them to the Department filled in, on the 1st and 15th of each month.

In the costs of drilling given below all items of expense are given except transportation charges on drill and parts, wear and tear, and renewal of parts and interest on first cost.

Of the above items, the only one which prospective drillers in making their estimates should add to what have already been given in the cost sheets, is the first, the other items being defrayed by the Department.

Both speeds and costs of drilling have been reduced during the year.

ITINERARY TABLE.

No. and Description of Drill.	Locality of Boring.	Mineral Bored for.	Dates of Occupation.
No. 1 ("Calyx" steam) 1000 feet.	Nictaux, Annapolis Co. Kennetcook, Hants Co. River Inhabitants, Rich. Co. Glendale, Richmond Co. Port Hood, Inverness Co. St. Rose, " " Cheticamp, " "	Iron. Coal. " " " " "	Oct. 1900 to June, 1901. Aug., 1901 to Dec., 1901. Mar., 1902 to Sept. 1902. Sept., 1902 to Oct., 1902. Oct., 1902 to Dec., 1903. Dec., 1903 to July, 1904. July, 1904 to
No. 2. ("Diamond" steam) 850 feet.	Pottle's Lake and Ferris Lake Cape Breton Co. Drummond Colliery, Pictou Co Foxbrook Road, do Stanley, Hants Co. Kemptown, Col. Co.	Coal " " " "	Nov., 1900 to Oct., 1901. Nov., 1901 to Nov., 1902. Nov., 1902 to Sept., 1903. Sept., 1903 to April, 1904. April, 1904 to Aug., 1904.
No. 3. "Diamond" hand) 400 feet.	Whycocomagh, Inverness Co. Bridgeport Basin, C. B. Co. Mira Road, Cape Breton Co. Polson's Brook, Antigonish Co. Pleasant Valley, Antig. Co. Storehouse,	Iron. Coal. " Iron. Coal.	1901 to Oct., 1901. Nov., 1901 to Nov. 1902. March, 1902 to July, 1903. July, 1903 to Oct., 1903. Oct., 1903 to Dec., 1903. Dec., 1903 to Oct., 1904.
No. 4. ("Diamond" hand) 400 feet.	Musquodoboit Valley, Hx. Co. Stewiacke Valley, Hx. Co. South Maitland, Hants Co. Lake Ainslie, Inv. Co. Boularderie Island, C. B. Co. Glendale, Inverness Co. Storehouse.	Coal. " " Iron. Coal. "	1901 to March, 1902. Mar., 1902 to Oct., 1902. Oct., 1902 to Feb., 1903. Feb., 1903 to May, 1903. May, 1903 to Oct., 1903. Oct., 1903 to Dec., 1903. Dec., 1903 to Oct., 1904.
No. 5. ("Calyx" steam) 1000 feet.	Hantsport, Hants Co. Apple River, Cumb. Co.	Coal. "	Sept., 1901 to Aug., 1903. Sept., 1903 to
No. 6. ("Calyx" steam) 3000 feet.	New Glasgow, Pictou Co. Port Morien, C. B. Co.	Coal. "	Sept., 1902 to Sept., 1904. Sept., 1904 to
No. 7. "Calyx" steam) 350 feet.	Broad Cove, Inv. Co. Port Hood, Inv. Co. Barra Head, Richmond Co. Westville, Pictou Co. Storehouse.	Coal. " Limestone. Coal.	Mar., 1902 to June, 1903. July, 1903 to Sept., 1903. Oct., 1903 to Dec., 1903. Feb., 1904 to April, 1904. April, 1904 to Oct., 1904.

Drill No. 1.

After the somewhat extensive series of borings were finished at Port Hood the drill was obtained by the N. S. Collieries, Ltd., to bore at St. Rose, Inverness Co.

St. Rose Borehole This hole was situated on the Neil McLeod Brook so-called, about 300 feet down said brook from the main road. The drill was moved here in December, 1903, and after the site was selected considerable difficulty and delay occurred in obtaining casing which was finally got through the surface material (a distance of 63 feet) and boring commenced in the rock on April 1st, 1904.

The following is a record of the strata passed through:—

NAME OF ROCK.	Thickness Bored.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Surface material	63	.....	.....	.....
Blue shale	3	.....	.....	.....
Grey sandstone	13	.....	.....	.....
Light bluish shale.....	10	1	.....	.....
Bright coal.....	4	1	.....	.....
Soft black shale.....	1	.....	.....	.....
Fire clay.....	.....	6	.....	.....
Shale	4	2	.....	.....
Dark shale	3	10	.....	.....
Light shale.....	1	11	.....	.....
Coaly shale.....	2	6	.....	.....
Light shale.....	.....	6	.....	.....
Coaly shale.....	3	6	.....	.....
Light bluish shale	7	6	.....	.....
Fine grey sandstone	1	2	.....	.....
Dense blue shale.....	3	.....	.....	.....
Bluish sandstone.....	.....	5	.....	.....
Dense blue shale, dark bands	32	11	.....	.....
Conglomeritic sandstone	2	10	.....	.....
Light colored shales.....	46	1	.....	.....
Dark shale, marine fossils	16	7	.....	.....
Blue sandstone, "	5	5	.....	.....
Light blue fossiliferous shales.....	8	3	.....	.....
Dark fossiliferous shales.....	7	2	.....	.....
Light shale with band of sandstone.....	37	10	.....	.....
Dark shale.....	2	8	.....	.....

NAME OF ROCK.	Thickness Bored.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Dirty coal	8	4	.....	.....
Black shale.....	3	.....	.....	.....
Grey sandstone	31	10	.....	.....
Hard blue arenaceous shale.....	4	10	.....	.....
Grey sandstone	23	1	.....	.....
Hard blue shale.....	8	2	.....	.....
Coaly matter.....	.....	5	.....	.....
Bands of blue shale and sandstone.....	23	11	.....	.....
Blue shale	17	1	.....	.....
Coaly matter .....	.....	8	.....	.....
Fire clay.....	.....	4	.....	.....
Dirty coal.....	1	9	.....	.....
Dark and grey sandstone	9	9	.....	.....
Hard blue shale.....	27	7	.....	.....
Dark and grey sandstone showing fossils....	13	3	.....	.....
Hard blue shale.....	8	9	.....	.....
Grey and dark sandstones (very fine.)	7	2	.....	.....
Light blue shale	9	4	.....	.....
Grey sandstone.....	22	.....	.....	.....
Hard blue shale.....	9	2	.....	.....
Dark sandstone.....	10	3	.....	.....
Hard blue shale.....	14	11	.....	.....
Grey sandstone.....	11	7	.....	.....
Hard dark shale	15	.....	.....	.....
“ “ sandstone.....	.....	10	.....	.....
Bright coal.....	8	.....	.....	.....
Blue fire clay.....	1	4	.....	.....
Hard blue shale.....	12	4	.....	.....
Fine grey sandstone	9	9	.....	.....
Dark and blue shales	28	.....	.....	.....
Grey sandstone.....	10	4	.....	.....
Blue shale	11	9	647	4

Cheticamp The next operators with this drill were the C. B. Island, Bore- Exploration Coal and Development Company, whose hole No. 1. property is situated at Cheticamp Island, where the drill was transferred, and where boring commenced on August 9th, and continued until September 17th.

The record of this hole gives a section as follows :

Name of Rock.	Thickness bored		Total depth from surface	
	Ft.	In.	Ft.	In.
Surface, loam and clay.....	13	.....	.....	.....
Coarse grey sandstone.....	6	.....	.....	.....
Brown shale.....	3	1	.....	.....
Brown and grey sandstone.....	50	7	.....	.....
Reddish shale.....	36	8	.....	.....
Blue shale.....	1	.....	.....	.....
Reddish shale.....	67	5	.....	.....
“ sandstone.....	109	5	.....	.....
Grey sandstone.....	29	4	.....	.....
Dark brown and blue shale.....	17	8	.....	.....
Grey sandstone.....	86	9	.....	.....
Dark brown shale.....	10	9	.....	.....
“ “ sandstone.....	3	.....	.....	.....
“ “ shale.....	6	6	.....	.....
Blue shale.....	2	.....	.....	.....
Dark brown shale.....	28	2	.....	.....
Brown sandstone.....	3	2	.....	.....
Blue and grey sandstone.....	85	11	.....	.....
Grey and brown sandstone.....	71	9	.....	.....
Brown arenaceous shale.....	31	2	663	4

The cost of this hole amounted to \$1.07 per foot made up as follows:—

ITEM.	Total Cost.
Labour and management.....	\$446 76
Fuel.....	130 00
Shot and gravel.....	30 00
Drive pipe or casing.....	4 00
Cement.....	1 50
Light, oil, waste, etc.....	4 70
Material used in housing, boxing cores, etc.....	126 00
Total.....	\$742 96
Cost per foot.....	\$ 1 07

Cheticamp Bore- Another hole was commenced but was abandoned immediately—only 15 feet of surface having been pierced.
hole No. 2.

Drill No. 2.

Stanley Bore-hole No. 1. During the past few years several areas have been taken up for coal in the Kennetcook Valley. To test these measures this drill was procured by a Windsor Company and the record of the first hole, which was commenced on Sept. 22nd, 1903, is as follows :—

NAME OF ROCK.	Thickness bored.		Total depth from surface.	
	Ft.	In.	Ft.	In.
Surface material.....	68	.....	.....	.....
Grey sandstone.....	16	.....	.....	.....
Reddish shale.....	16	.....	.....	.....
Grey sandstone.....	35	.....	.....	.....
Reddish shale.....	41	02	.....	.....
Red sandstone.....	28	.....	.....	.....
Grey sandstone.....	11	04	.....	.....
Red sandstone.....	7	.....	.....	.....
Grey sandstone.....	22	.....	.....	.....
Soft red shale.....	16	.....	.....	.....
Grey sandstone.....	15	.....	.....	.....
Reddish shale.....	8	.....	.....	.....
Reddish sandstone.....	4	.....	.....	.....
Reddish shale.....	20	06	.....	.....
Reddish sandstone.....	22	.....	.....	.....
Soft Agrillaceous red shale	1	.....	.....	.....
Grey sandstone.....	19	.....	.....	.....
Soft Agrillaceous red shale	22	6	.....	.....
Red sandstone.....	8	.....	.....	.....
Grey sandstone.....	12	.....	.....	.....
Grey sandstone	21	.....	.....	.....
Red sandstone.....	3	.....	.....	.....
Soft red shale.....	27	.....	.....	.....
Red sandstone.....	25	.....	.....	.....
Grey sandstone.....	7	.....	.....	.....
Soft red shale.....	16	.....	491...	06

The boring was finished on December 19th, 1903. Only one shift was employed during the drilling, and 36 shifts were consumed in the whole operation, giving an average result of 13.63 feet per shift, equivalent to 27.36 feet per day of 24 hours.

COST OF STANLEY (No. 1.) BOREHOLE.

ITEM	Total Cost
Labor and management	\$414 40
Fuel (wood).....	27 50
Carbon wear (estimated) at \$60.00 per carat	90 00
Material used in housing	16 00
Casing	40 25
Light, oil, waste.....	3 50
Total	\$591 65
Cost per foot	\$1 20

Stanley Borehole After finishing borehole No. 1, the drill No. 2. was taken to the Tom Cod Brook some distance to the north of No. 1 hole where boring commenced on Feb. 15, 1904, and finished on March 18th, 1904.

The strata passed through is given below :

NAME OF ROCK.	Thickness bored.		Total depth from surface.	
	Ft.	In.	Ft.	In.
Surface material.....	5			
Soft red shale.....	8			
Red and grey sandstone.....	25			
Soft red shale.....	8			
Grey sandstone.....	22			
Soft red shale.....	5			
Red sandstone.....	12			
Soft red shale.....	31			
Red and grey sandstone.....	34			
Soft red shale.....	10			
Dark grey shale.....	10			
Dark grey sandstone.....	18			
Dark grey shale.....	3			
Grey sandstone.....	27			
Red sandstone.....	5			
Soft red shale.....	48			
Red sandstone.....	5			
Soft red shale.....	20			
Red sandstone.....	39			
Grey sandstone.....	6			
Red sandstone.....	19			
Soft red shale.....	10		370	

The boring was done single shift and at an average rate of 17.61 feet per shift, or 35.22 feet per day.

COST OF STANLEY (No. 2) BOREHOLE.

ITEM.	Total Cost.
Labour and management.....	\$290 40
Fuel (wood and coal).....	39 00
Carbon cost (estimated) at \$60. per carat	30 00
Housing of drill. etc.....	21 00
Casing pipe.....	6 00
Oil, waste, light, etc.....	2 50
Total.....	\$388 40
Cost per foot.....	\$ 1 04

Kempton Borehole. From April 15th, 1904, to August 10th, 1904, the drill bored a hole 900 feet in depth on an area belonging to J. H. McKay and others at Kempton, Colchester County. Although some of the measures passed through looked fairly promising, the only seam intersected was one showing 1 ft. 5 inches of coal. 36 shifts were consumed in actual boring the total operation averaging a speed of 10.46 feet per shift or 20.92 feet per day.

On completion of this hole of which a section is given below, the drill was shipped to the store-house at Westville.

KEMPTOWN BOREHOLE.

NAME OF ROCK.	Thickness Bored.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Surface	11			
Soft red slate.....	10			
Hard grey slate.....	11			
Red shale.....	16			
Hard grey sandstone	12			
Reddish shale	16			
“ sandstone	2			
“ shale.....	12			

KEMPTOWN BOREHOLE — (*Continued.*)

NAME OF ROCK.	Thickness Bored.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Grey sandstone	8	.....	.....	.....
Red shale.....	9	.....	.....	.....
“ sandstone	7	.....	.....	.....
“ shale	22	.....	.....	.....
“ sandstone	4	.....	.....	.....
“ shale with hard bands and grey streaks.	53	.....	.....	.....
Grey sandstone	7	.....	.....	.....
Red shale	14	.....	.....	.....
Grey sandstone.....	26	.....	.....	.....
Soft red shale	17	.....	.....	.....
Grey sandstone	9	.....	.....	.....
Alternate bands of red and dark grey shales	61	.....	.....	.....
Dark grey sandstone.....	14	.....	.....	.....
Alternate bands of red and dark grey shales.	40	.....	.....	.....
Dark grey sandstone.....	3	.....	.....	.....
Alternate bands of dark grey and red shales.	46	.....	.....	.....
Dark grey sandstone.....	10	.....	.....	.....
Dark grey shale.....	40	.....	.....	.....
Red shale	2	.....	.....	.....
Dark grey shale.....	88	.....	.....	.....
Coal	1	5	.....	.....
Dark grey shale.....	78	.....	.....	.....
Red shale	5	7	.....	.....
Grey “	23	.....	.....	.....
Red “	14	.....	.....	.....
Grey sandstone	2	.....	.....	.....
Red shale.....	22	.....	.....	.....
Grey sandstone	4	.....	.....	.....
Red shale	9	.....	.....	.....
“ sandstone	6	.....	.....	.....
“ shale	56	.....	.....	.....
Soft red shale.....	5	.....	.....	.....
Dark grey shale.....	6	.....	.....	.....
Soft “ and red shale	7	.....	.....	.....
Hard grey sandstone.....	7	.....	.....	.....
Soft red shale.....	6	.....	.....	.....
Hard red sandstone.....	8	.....	.....	.....
“ dark grey and red shale.....	54	.....	.....	.....
Very hard grey sandstone showing quartz...	6	.....	.....	.....
Soft red shale	10	.....	900	.....

COST OF BOREHOLE AT KEMPTOWN.

ITEM.	Total Cost
Labor and management	\$1139 35
Fuel (wood and coal)	70 40
Carbon wear (estimated) at \$60.00 per carat.....	105 00
Casing pipe	2 70
Light, oil, waste, etc.	4 55
Total	\$1322 00
Cost per foot.....	\$1 46

Drill No. 3.

As shown by the Itinerary report no drilling was done by No. 3 drill since the last report.

Drill No. 4.

This drill bored 46 feet 7 inches chiefly in soft grey shales at Glendale, Inverness Co.

The work was done by a syndicate of Pictou County men, and work was stopped in December, 1903, on account of the severe weather.

Drill No. 5.

Apple River Borehole. This Calyx drill was obtained by Mr. J. A. Johnson in August, 1903, and moved to Apple River, Cumberland County, where boring was commenced on September 18th, 1903. The object of this hole was to test the underlying measures for a continuation of the Cumberland coal seams. In last season's report the record of the hole was given down to a depth of 86 feet. From that depth the drill penetrated the strata given below to a total depth of 943 feet 9 inches, when drilling was discontinued on September 10th, 1904. The boring here was very slow especially when the hole entered the "old rocks" underlying the Conglomerate. Many delays occurred also in procuring supplies owing to the apparent neglect of the manufacturers.

The drill was stored in the locality with the idea of later on boring another hole with the same purpose in view.

NAME OF ROCK.	Thickness bored.		Total depth from surface.	
	Ft.	In.	Ft.	In.
Depth of hole given before.....			86	00
Reddish conglomerate.....	807	06		
Reddish granitic rocks.....	50	03	943	09

Drill No. 6.

The object of boring and name of operators of the first hole bored with this drill was given in the report for year ending September 30th, 1903.

After boring 401 feet in the sandstones which are here assigned to the Permian group, the drill pierced the so-called New Glasgow conglomerate.

At 565 feet a core barrel and bit were lost in the hole and as reaming and casing were necessary the hole was abandoned and another hole put down by contract, with a churn drill and boring stopped at 2000 feet, the drill was still in the conglomerate formation.

Early in September the drill was moved to Port Morien, C. B. Co., where drilling commenced on September 27th, 1904.

As boring here is still in progress the record of this important hole will be given in the next report.

Drill No. 7.

Boring commenced with this machine at Barra Head, near St. Peter's, Richmond County, on October 15th, for Messrs. Lithgow and Brookfield, and between that date and December 29th five holes were bored, of which the following particulars are given :

No. of hole	Name of Rock	Depth bored	
		Ft.	In.
1	Blue limestone	49	6
2	" "	50	.....
3	" "	75	.....
4	" "	45	.....
5	Clay	14	.....
Total		233	06

This limestone rock is said to be suitable for making an excellent cement.

At the Drummond Colliery, Westville, a hole was bored on one of the lower levels but was abandoned after 30 feet had been pierced.

SUMMARY STATEMENT OF THE YEAR'S WORK.

SITUATION OF BOREHOLE.	No. of drill.	Depth of hole.		Average cost per foot.	Average rate of boring per day.	
		Ft.	In.		Ft.	In.
St. Rose.....	1	647	04	not obt'd.	not	obt'd.
Cheticamp No. 1.....	1	663	10	\$1 07	7	04
Stanley No. 1.....	2	490	00	1 20	27	03
Stanley No. 2.....	2	370	00	1 04	35	02
Kemptown.....	2	900	00	1 46	20	11
Glendale.....	4	46	07	not obt'd.	not	obt'd.
Apple River.....	5	943	09	"	"	"
New Glasgow.....	6	565	00	"	"	"
Barra Head (5 holes).....	7	233	06	"	"	"
Westville.....	7	30	00	"	"	"
Total.....		4889	00			

All of which, together with the memorandum on Iron, Copper, etc., I beg to submit.

D'ARCY WEATHERBE, C. E.,

Mines Department.

PROVINCIAL MUSEUM AND SCIENCE LIBRARY.

PROVINCIAL MUSEUM,

Halifax, N. S., 18th January, 1905.

To E. GILPIN, JR., ESQ., LL. D., I. S. O., etc.,

Deputy Commissioner of Public Works and Mines :—

SIR,—I respectfully present herein a report on the Provincial Museum of Nova Scotia and the Provincial Science Library, for the calendar year 1904.

PROVINCIAL MUSEUM.

During the year 494 accessions were catalogued, representing 742 specimens, almost entirely relating to the province. The following summary gives the number of additions that have been received during the past five years :—

1900.....	1202	specimens=	133	accessions.
1901.....	2660	"	= 546	"
1902.....	2039*	"	= 816*	"
1903.....	1911	"	= 744	"
1904.....	742	"	= 494	"
			=	"
Total: 5 years....	8554	"	=2733	"

Economic Minerals at Provincial Exhibition.—The permanent collection of economic minerals of the province which was brought together for exhibition purposes in 1903, as detailed in the report for that year, after being stored during the interim, was again shown at the Provincial Exhibition held in Halifax from the 7th to the 14th September, 1904.

For a short time in August and September I collected additional specimens for the collection from the Lochaber district, Antigonish Co., and the manganese producing district of Hants Co., from Walton to Noel, and otherwise added to the set.

The collection as shown in 1904 consisted of about 224 large samples, of almost double as many individual specimens, and occupied

*These figures correct those in report for 1902, where they appeared as 2021 and 758

about 168 running feet of shelving and table space. The samples may be grouped as follows:

Coal	17	Dolomite	3
Gold and samples illustrating processes for extraction	36	Barite	8
Graphite	2	Freestone	18
Petroleum	1	Grindstone and scythestone . .	3
Lead	3	Granite	5
Copper	18	Slate	3
Iron, including ochre	35	Fireclay and altered felsite . .	4
Products of iron & steel works	17	Clay and bricks	13
Gypsum	13	Moulding sand	3
Anhydrite	1	Talc	1
Manganese	7	Diatomaceous earth	2
Stibnite	2	Brine	1
Limestone and marble	8	Total	224

In addition to the specimens, there were shown 98 photographs, etc., of mining properties and plants, and geological and mineralogical maps.

Besides the specimens of gold belonging to the department, there was on view a particularly fine set of nuggets, etc., valued at \$3,000, from the King Mine at Brookfield, loaned by A. M. King, of Annapolis; and also an exact model of the large nugget from the West Lake Mine at Mount Uniacke, the original of which, valued at \$1,000, was then at the St. Louis Exhibition. The collection also included gold ore from the thirty-feet vein then just cut at a depth of 500 feet in the Dolliver Mountain Mining and Milling Co.'s shaft at Isaac's Harbour, and samples illustrating the cyanide and chlorination processes of gold extraction as in use in this province.

One of the most interesting exhibits was a very fine sectional model, on a scale of 150 feet to the inch, of the Goldenville Gold District, constructed of plate-glass by E. R. Faribault, of the Geological Survey of Canada, illustrating the structure of a typical anticlinal gold-bearing district, to a depth of two thousand feet. This is the property of the Mining Society of Nova Scotia.

The Dominion Antimony Company showed some fine samples of antimony ore from its mine at West Gore, Hants County.

The collection occupied a better situation than last year, being located in the large apartment off the gallery on the east side of the building. A very much more effective arrangement was possible there than in the location occupied the previous year. The entire space was filled with the display, which was made as attractive as possible, being decorated with flags, bunting and miners' tools.

My remarks in last year's report regarding the location of the collection, and the necessity for a separate building for mines and

minerals, are however, equally applicable in the present instance. The character of the collection is manifestly that of a permanent exhibit, and packing and unpacking, the re-erection yearly of structures and the hurried arrangement of decorations, are destructive to the appearance of the samples as well as costly. The great weight of material which is thus placed on an upper floor crowded with people, is also a matter which should be taken into consideration.

Exhibit at Glace Bay.—On the close of the Halifax exhibition on the 14th September, the collection of economic minerals, with the exception of the coal and gold samples, numbering about 150 specimens and weighing about two tons, was immediately packed and shipped by your direction to Glace Bay, where I arranged and exhibited it under the name of the Provincial Government at the Glace Bay Industrial and Mercantile Fair which was held from 19th to 24th September, where it attracted much attention. On the close of this exhibition the collection was returned to Halifax and stored for the winter at the exhibition building.

Minerals and Rocks in Museum.—About 167 specimens of minerals and rocks were obtained for the museum collection while collecting at Lochaber and in Hants, and also from Cape Breton while I was at Glace Bay with the exhibit, my spare time at the latter place being occupied in collecting. Collections have also been made in the vicinity of Chester.

The entire museum collection of Nova Scotian minerals has been re-arranged during the year, and new specimens from unrepresented localities have been incorporated with it, so that the cabinet specimens which before occupied about four $5 \times 2\frac{1}{2}$ ft. glazed table-cases now occupy more than ten such cases, and still the space is not at all sufficient for the proper display of the present specimens or accommodation of additions.

The collection of Nova Scotian rocks, with full data, is now a large one and occupies a set of fifty drawers beneath the table cases. This collection has been almost entirely obtained by myself and brought together during the past five years, and is trimmed to uniform size and labelled with name, formation, exact locality, etc. At the first opportunity it will be arranged throughout according to formations. Besides its ordinary geological interest such a set is of still further practical use as showing the prospector the characters of the rocks in which certain minerals are liable to occur. To be most useful it should be displayed in glazed table-cases, but its arrangement in drawers is the best that can be done with the present accommodation.

As before mentioned, an exact cast made from a gelatine mould and afterwards coloured and gilded, has been prepared of the exceedingly fine gold nugget, valued at \$1,000, which was obtained at the West Lake Mine, Mount Uniacke, and which attracted much attention when exhibited with the department's minerals at the 1903

exhibition. A series of such casts, made as opportunity offers, would be most interesting and inexpensive.

The Mining Society of Nova Scotia has deposited in the Museum Mr. Faribault's sectional model of the Goldenville Gold District, which has proved of great interest to gold miners and illustrates thoroughly and plainly the structure of a domed anticline and its relations to the subject of deep mining.

The principal donors of minerals and rocks are the following : Dr. H. S. Poole, F. H. Mason, T. V. Hill, R. Kirkpatrick, G. J. Mac-kintosh, W. H. Prest and J. Maxwell.

Fossils.—The specimens of Nova Scotian fossils have been brought together, having before been interspersed with some foreign specimens. While the museum is strong in carboniferous fossils, it has but a poor representation of those from the older measures.

Mammals.—A number of additions have been made to the collection of small mammals of the province, regarding which but little is yet definitely known, particularly in the light of recent investigation. In this we have been assisted by J. Perrin, of McNab's Island, F. H. Reid, of Middleton, and Miss H. M. King, of Halifax. A mounted Black Bear, of which we had not before a specimen, has been presented by the estate of C. S. Lane, furrier, of Halifax. We still require specimens of the Sable or Pine Martin, Pekan or Fisher, Beaver and Otter, as well as of the Moose and Woodland Caribou. These are among our most valuable fur-bearing animals and chief big game, and should certainly be represented.

Birds.—A number of blanks in the collection of native birds have been filled, rare species now chiefly being wanted. Lists of desiderata of this kind have been sent out to various collectors in the province with good results, E. C. Allen, R. W. Tufts, F. H. Reid, L. E. Allen and F. C. Bell donating specimens.

Some of the more noteworthy additions are a Brown Pelican (*P. fuscus*) killed at Louisburg, C. B., on 19th May, 1904; a Great Grey Owl (*S. cinereum*) taken at North Port, Cumb. Co., in June, 1903; a Canvas back Duck (*A. vallisneria*) killed at Cole Harbour, Hx. Co., on 30th Dec., 1903; Blue Bird (*S. sialis*), Nictaux, 19th June, 1904. Bicknell's Thrush (*H. aliciae bicknelli*) near Yarmouth, 18th June, 1904; Little Blue Heron (*A. coerulea*), Cow Bay, Hx. Co., 1st June, 1904; Florida Gallinule (*G. galeata*), Lawrencetown, Hx. Co., 5th Oct., 1904; and Holboell's Grebe (*C. holboellii*), Three Fathom Harbour, 2nd March, 1904.

Systematically recorded observations on bird migration, such as are made for the U. S. Department of Agriculture, have been received as in previous years from R. W. Tufts, Wolfville; E. C. Allen, Yar-

mouth; L. E. Allen, Salem, Yar. Co.; F. H. Reid, Middleton; J. W. McL. Bouteillier, Sable Island; and John Crowell, Seal Island Light-house.

R. R. McLeod has presented some rare nests of Nova Scotian birds.

Fish and Marine Invertebrates.—But few accessions have been received in these departments.

Insects.—J. Perrin of McNab's Island has been engaged during the past summer in collecting for the Museum a set of lepidoptera of the district. The study of these insects is of much importance to the agriculturist, and a good reference collection has long been a desideratum.

Botany.—Hardly any additions have been made to the herbarium, and as it already includes 3,327 specimens, as detailed in the last report, it may be considered reasonably complete. No opportunity has yet offered to undertake the extensive work of mounting the large number of specimens which are loose between sheets, although accompanied by full data.

Archæology.—Many pieces of prehistoric Indian pottery and stone arrowheads, etc., found at Chester Basin, Lunenburg Co., have been presented by Charles H. Mills; and L. A. Petrie has donated some French and old Scotch relics from the Mira River and Louisbourg districts.

Miscellaneous.—There has been loaned to the Museum a case containing a series of eighteen gold, silver and bronze medals received by the Nova Scotia Fruit Growers' Association, J. W. Bigelow and others for exhibits of Nova Scotian apples, etc., from 1862 to 1900.

As much information as possible relating to the mines, minerals and other resources of the province has been communicated to inquirers, verbally or by letter; the Museum, as I am much pleased to see, being applied to as a source of information on all such subjects. Every effort is made to be of as much assistance as possible in this respect.

It may be mentioned that much demands have been made upon the time of the Curator in connection with his duties as Keeper of the Public Records of the province, to which large accessions have been made during the year, necessitating arrangement, cataloguing and storing.

A list of donors is appended:—

DONORS.

Allen (E. C.), Yarmouth; Allen (L. E.), Salem.

Bell (Frank C.), Sydney; Bigelow (J. W.), Wolfville; Bouteillier (J. W. McL.), Sable Island; Broadbent (R. L.), Ottawa; Brookfield (S. M.); Brookfield Mining Co., North Brookfield.

Campbell (Duncan R.); Carlyle (Fred.), Waverley; Chipman, (B. W.); Church (Miss H. A.), Chester; Colonial Copper Co., Cape D'Or; Corbett (Joseph M.), Five Islands; Creighton (Jermain), Dartmouth; Crowell (John), Seal Island Lighthouse.

Dixon (John); Dolliver Mountain Mining & Milling Co., Isaac's Harbor; Dominion Antimony Co.; Dominion Coal Co., Glace Bay; Dominion Lime & Quarrying Co., North Sydney; Donkin (Hiram), Glace Bay.

Ellis (Charles F.), Selmah.

Finlayson (Duncan), M.P.P., Arichat.

Hallet (W.); Hamilton (A. G.), North Sydney; Hayward (A. A.); Hill (T. Vardy),; Hill (C. G.), Cape D'Or; Hiltz (Henry A.), Chester; Hiseler (Stephen A.); Hudson (Joseph G. S.), Glace Bay.

Intercolonial Coal Mining Co., Westville; Inverness Mining Co.

Johns (Thomas W.), Yarmouth.

King (Miss Helen M.); Kirkpatrick (Robie), Kirk's Hill.

Lane (Charles S.), estate of; Leahy (E. J.), Amherst; Leigh (Rev. R. M.), Canso; LeTete Gold & Copper Mining Co., N. B.; Lordley (Capt. E. D.), Chester.

McCormack (—), Leitch's Creek; McCullouch (John), Walton; McDonald (Arch.), Whycomomagh; Mackintosh (Geo. J.); McKay (Alex.), Lansdowne; "MacKay-Bennett," Cable S. S.; McKenzie (Jas. W.); McLeod (R. R.), Brookfield; Mason (F. H.); Maxwell (James), Westville; Merriman (Mrs. M. MacC.), Pictou; Mills (Charles H.), Chester Basin; Mills (Col. D.), Jamaica; Mic-Mac Mining Co., Leipsigate; Mines Department; Montreal Copper Co., Montreal; Murdock (Ernest), South Lochaber; Murphy (Dr. Martin; Murray (Hon. G. H.)

Northrup (R.), Scotch Village.

Odell (Miss E. P.), Truro.

Parsons (Albert), Walton; Perrin (J.), McNab's Island; Petrie (L. A.), Glace Bay; Phinney (J. L.), Apple River; Piers (Charles), North West Arm; Poole (Dr. Henry S.); Prest (Walter H.), West Caledonia.

Reid (Frank H.), Middleton; Raine (John).

Skerry (Wm.), Montague; Stephens (Wm.), Walton; Stephens (Wm. F.), Tennycap; Schenk (Capt. L. G.), Cable S. S. "MacKay-Bennett."

Ternan (Gerald B.), Bedford; Tompkins (Thomas), Margaree Forks; Tufts (Robie W.), Wolfville.

Wallace (C. C.); Weatherbe (D'Arcy); Wright (John), Minesville.

 SCIENCE LIBRARY.

The total number of books and pamphlets received from all sources for the calendar year 1904 was 3,115. Of these, 2,330 books and pamphlets were received through the Nova Scotian Institute of Science; 336 were purchases, transfers from the Mines Department, Mining Society, Legislative Library and donations; and 449 were non-society periodicals. This large number of accessions necessitated much work in cataloguing and arranging on the shelves.

Besides the many works consulted in the library, 519 books and pamphlets were borrowed.*

In addition to the very many serials received in exchange, about five hundred dollars' worth of the most recent and highly approved manuals and treatises have been ordered on the following subjects :

Mining	Gas & petroleum engines	Brass founding
Prospecting	Bridges and roofs	Hall-marking
Mine sampling	Improvement of towns	Paper making
Mine drainage	Roads and pavements	Flour manufacture
Mine machinery	Water supply	Clocks, watches & bells
Ore dressing	Water bacteriology	Blacksmithing
Mine recovery	Hydraulics & water power	Coach building
Astronomy	Dams	Boot making
Surveying	Sewerage	Stone-working
Chemistry	Cremation	Carpentering
Mineralogy	Agriculture	Plumbing
Geology	Horticulture	Gas-fitting
Physical geography	Cider making	Sign painting
Archæology	Greenhouse construction	Navigation
Zoology	Forestry	Seamanship
Botany	Timber	Ship-building
Engineering	Horses	Mast-making
Railways	Bee-keeping	Rigging
Steam boilers	Metallurgy	Sail-making
Locomotives	Assaying	Architecture
Boiler making	Paints	Mechanical drawing
Electric tramways	Metal working.	Psychology

These books almost entirely have some bearing upon the resources and industries of the province, and this aspect has always been kept in mind in ordering works.

Fifteen volumes of the "International Library of Technology," the text-books issued by the International Correspondence Schools, have been purchased, and been much consulted by the users of the Library.

The Library has been of much assistance to the staff and students of the Dalhousie School of Mining and Metallurgy, and an increased use generally of the institution is noticeable.

* In 1901, 158 books and pamphlets were borrowed; in 1902, 163; and in 1903, 296.

No opportunity has yet offered to prepare and publish a catalogue of the books, which is greatly needed in order to place the Library's resources before the public in the way which would much increase its usefulness, as thereby readers would be informed of what help to them in their various lines of work many of our books would be.

The second annual issue of the "International Catalogue of Scientific Literature" has been received and is of use in giving references to the scientific serials with which the Library is so well supplied.

A small number of volumes have been bound during the year, but such is but a very small amount of the binding that is most urgently needed. In this respect I beg to respectfully call attention to my remarks on the subject in last year's report.

As will be seen from the figures before given, numerically the greater number of accessions have been received through the exchange list of the Nova Scotian Institute of Science, but works have also been received from the Mining Society of Nova Scotia, and transfers from the Legislative Library, the Mines Department, the Education Office and Dr. Gilpin, as well as by donations from W. H. Prest, F. B. Crofton, Dr. A. P. Reid and J. G. S. Hudson.

No movement has yet been made to transfer the various pamphlets on scientific subjects from the Legislative Library. Some of these, such as reports, etc., on mineral lands, are often inquired for.

The following is a list of the non-society periodicals received :

Canadian Mining Review (monthly), Ottawa.
Coal Trade Journal (weekly), New York.
Colliery Guardian (weekly), London.
Educational Review (monthly), St. John.
Engineering and Mining Journal (weekly), New York.
Engineering Review: late Feilden's Magazine (monthly), London.
Industrial Advocate (monthly), Halifax.
Maritime Mining Record (semi-monthly), Stellarton.
Mines and Minerals (monthly), Scranton, Pa.
Mining Journal (weekly), London.
Nature (weekly), London.
Science (weekly), New York.
Scientific American Supplement (weekly), New York.

I have the honor to be, Sir,

Your most obedient servant,

HARRY PIERS,

Curator and Librarian.

I remain, Sir,

Your obedient servant,

EDWIN GILPIN, JR.,

Deputy Commissioner of Public Works and Mines and Inspector of Mines.

TABLES

LIST OF MINERAL LEASES (OTHER THAN GOLD.)

IRON.

No. of LEASE.	NAME OF OWNER.	COUNTY.	NAME AND ADDRESS OF AGENT OF COMPANY.
232, 257.....	Brookman, R. J., est. et al.....	Cape Breton..	.....
320.....	Archibald, C.....	"	.....
296.....	Hamilton, A. G.....	"	.....
310, 311.....	C. B. Coal, I. and Ry. Co.....	"	McInnes, H., Halifax.
324.....	Moseley, E. W.....	"	.....
247.....	McNeil, Hector F., et al.....	"	.....
191, 197.....	McVicar, John, est. of.....	"	.....
289.....	Greener, John, est. of, et al....	"	.....
292.....	Smith, Wiley.....	"	.....
258, 259, 260, 316.....	MacPherson, M. A., Rev.....	"	.....
47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 87, 93/44.....	} Bartlett, James H.....	Pictou.....	.....
68, 71, 83, 70.....	N. S. Steel and Coal Co.....	"	McColl, A., New Glasgow,
10.....	Fraser, A. P., et al.....	Inverness.....	.....
137, 138, 139.....	Lake Ainslie Mng. Co.....	"	McKay, D. L. South Lake Ainslie.
140.....	Lewis Mt. Mng. Co.....	"	"
7.....	McDonald, Lauchlin.....	Antigonish....	.....
8, 9, 10, 11.....	Cowlam, Geo. B., et al.....	"	.....
16A.....	Workingmen's Prospecting, Develop'g & Mng. Co., Ltd....	"	Keith, J. W., New Glasgow.

14, 17, 18, 19.....	Wilkie, C. N.....	Antigonish ..	.....
1, 2	N. S Steel & Coal Co.	Guysborough.	.....
1.	Smith, W. H., est., et al.....	Hants. ....	.....
12	Matheson, Joseph	Richmond ..	.....
7	Curry, Nathaniel, et al	Colchester. ....	.....
COPPER, LEAD, ETC.			
126	Matheson, Alex	Cape Breton..	.....
286, 287, 70/95, 106, 250	Cape Breton Copper Co.....	" .....	.....
181	Burchell, John E., et al.....	" .....	.....
228	MacKenzie, John A., et al.....	" .....	.....
277	Shares, J. O. ....	" .....	.....
116	Greener, J. ....	" .....	.....
8	Jenkins, T. K., est., et al	Colchester ....	.....
5	Colonial Copper Co. ....	" .....	.....
2, 3	Franklyn, Geo. E., et al .....	" .....	.....
145	Henderson, George.	Inverness. ....	.....
62, 102, 103.	Inverness Mining Co., et al ..	" .....	.....
5. 16.	Fraser, John H	Antigonish ..	.....
12	McDonald, John H .....	" .....	.....
13	McDonald, A. K., et al .....	" .....	.....
88	Holmes, S. H	Pictou .....	.....
94	Pray, Henry C. ....	" .....	.....
6.	McLellan, John S	Victoria.....	.....
3.	Simpson, H. O., et al	Halifax.....	.....
135A.	McKenzie, Roderick	Cape Breton..	.....
142	LeCras, Henry. ....	" .....	.....
145	McLean, John.....	" .....	.....

LIST OF MINERAL LEASES (OTHER THAN GOLD.)—(Continued.)

COPPER, LEAD, ETC.

No. OF LEASE.	NAME OF OWNER.	COUNTY.	NAME AND ADDRESS OF AGENT OF COMPANY.
89.....	Creelman, Wm., et al.....	Pictou.....	.....
9, 10.....	Carre, Frederick E.....	Victoria.....	.....
83, 84, 85.....	Barton, A. McG., est.....	Pictou.....	.....
31, 1/23, 2/42, 4, 69, 95.....	Acadia Coal Co.....	".....	C. J. Coll, Stellarton.
5/12, 6/13, 7/14, 66.....	Intercolonial Coal Mfng. Co....	".....	C. Fergie, Westville.
46, 8/6.....	N. S. Steel and Coal Co.....	".....	A. McColl, New Glasgow.
10/24.....	Richey, M. H.....	".....	.....
11/11, 45, 9/10.....	Gray, B. G., est., et al.....	".....	.....
22/51, 104, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168.....	} Canada Coals and Ry. Co.	Cumberland..	.....
19/44, 16/6, 17/7, 18/8, 20/52, 21/55, 61, 61A, 62, 71, 72, 73, 75, 76, 77, 80, 82, 83, 84, 89, 90, 108, 110, 111, 112, 114, 115, 117, 121, 122, 123, 124, 66, 67, 68, 69, 125A, 126, 128, 129, 135, 137, 138, 58, 59, 60, 142, 143, 144, 145, 146, 147, 149, 150, 151, 152, 153, 154, 155, 94, 169, 170, 171.....	} Cumberland Railway and & Coal Company	Cumberland..	J. R. Cowans, Springhill.

MINES REPORT.

v

172	Stewart, C. J	Cumberland	.....
173	Weatherbe, U. J.	"	.....
6/12	Maritime Coal & R'y Co.	"	.....
131	Rogers, J. S., et al	"	.....
8/5	Smith, John T.	"	.....
134	Givan, F. W., et al	"	.....
140, 141	Prospect Coal Mng Co.	"	.....
9/22, 10/23, 11/28, 12/29, 13/30	Styles Mining Co.	"	.....
23/53	Strathcona Coal Co.	"	.....
26/16	Minudie Coal Co.	"	.....
86	Rutherford, John	"	.....
125	Fracklyn, Geo. E.	"	.....
24/47, 25/9	Boston Coal Mining Co.	"	.....
94A	Ripley, Enoch, et al	"	.....
42/52, 49/63	Montgomery-Moore, A. G., et al	Cape Breton	.....
13/79, 1/27, 2, 3, 28, 29, 30	N. S. Steel & Coal Co.	"	.....
173, 58/67, 298, 299, 300, 301, 303, 302, 304, 305, 306, 307	Weatherbe, Robert L.	Cape Breton	.....
111, 164	Sydney Coal Co.	"	.....
45/5, 46/28, 47/29, 50/40, 51/41, 52/42, 60/54, 61/55, 62/56, 63/57, 64/58, 65/59, 66/60, 67/61, 68/62, 69/63	Dominion Coal Co.	"	.....
108, 109, 110, 188, 207, 140, 252,			.....
253, 254, 255, 256, 262, 263, 264,			.....
265, 266, 267, 268, 269, 270, 271,			.....
272, 274, 278, 289, 280, 162, 239, 240, 322, 323			.....
290	McDonald, Alex.	"	.....
117, 246	Hamilton, A. G.	"	.....

LIST OF MINERAL LEASES (OTHER THAN GOLD).—Continued.

COPPER, LEAD, ETC.

No. of LEASE.	NAME OF OWNER.	COUNTY.	NAME AND ADDRESS OF AGENT OF COMPANY.
214, 220.....	Cayley Hugh St. Q.....	Cape Breton.	.....
179, 180, 190, 208, 223, 284.....	Roberts, Frank.....	"	.....
130.....	Bennett, Samuel C.....	"	.....
128, 129, 219, 139.....	Moseley, E. T., est.....	"	.....
203, 224.....	White, Alonzo J.....	"	.....
141, 177, 213, 244, 112, 113, 114, 115, 118, 283.....	Cumberland Railway & Coal Co. ....	"	.....
146, 193, 194, 216, 235, 312, 313, 314, 315.....	Gowrie and Blockhouse Collieries, Ltd.....	"	.....
169, 170, 183, 297.....	McVey, James.....	"	.....
165.....	Stephens, L. H., et al.....	"	.....
163, 185.....	Hamilton, C. F., est.....	"	.....
291.....	McCuish, D. A., et al.....	"	.....
136, 138, 184, 199, 211, 236.....	Atlantic Coal Co.....	"	.....
282, 324.....	Moseley, E. W.....	"	.....
285.....	McGowan, John.....	"	.....
293, 294, 321.....	McPherson, Rev. M. A.....	"	.....
186, 187, 202, 205, 206, 209.....	Kennelly, D. J.....	"	.....
210.....	Harold, T. C.....	"	.....
196, 222, 237, 161, 178.....	Routledge, Thomas, et al.....	"	.....

201, 221	Hickey, Cornelius	Cape Breton..	.....
131, 135, 144, 171, 174, 212, 231, 233, 243, 208, 309, 317, 318, 319 192, 215, 217, 226, 229, 234, 281, 295	{ Cape Breton Coal, Iron and R'y Co., Ltd.	"	Hector McInnes, Halifax.
128	Brookman, P., et al. ....	"	.....
175	McDonald, Joseph .....	"	.....
182, 200, 225	Cossitt, G. G., et al. ....	"	.....
167	Murray, John .....	"	.....
218	Morrison, Donald .....	"	.....
248	McMillan, John, et al. ....	"	.....
1 1/2	C. B. Coal Mng. Co.	Victoria .....	.....
7, 8	Dominion Coal Co. ....	"	.....
1/13, 6/4, 7/10, 19, 20, 26, 29, 30, 111, 112, 113	Port Hood Coal Co.	Inverness....	.....
125, 126, 131, 132, 133, 134, 135, 136, 141	C. B. Expl. Coal & Dev. Co....	"	.....
8, 9, 106, 107, 114, 115, 116, 117, 118, 119, 120, 121	Mabou Coal Mng. Co. ....	"	.....
11	Dawson, Geo., et al. ....	"	.....
15, 18, 24, 25, 28, 27, 40, 41, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 60, 61, 101, 104, 105, 123, 127, 130, 2/11, 147, 149, 146	{ Inverness Ry. & Coal Co., Ltd. ....	"	.....
128, 129	National Trust Co. ....	"	.....
124	Gorham, J. W., et al. ....	"	.....
35, 38, 39	Ross, Wm., et al. ....	"	.....
142	Tobin, T. F. ....	"	.....
143, 144	Dominion Coal Co. ....	"	.....

LIST OF MINERAL LEASES (OTHER THAN GOLD.)

COPPER, LEAD, ETC.

No. of LEASE.	NAME OF OWNERS.	COUNTY.	NAME AND ADDRESS OF AGENT OF COMPANY.
43, 44	Farquhar, J. A., et al.....	Inverness. ....	.....
32, 33, 34, 42	Wallace, C. M., et al .....	" .....	.....
63, 64, 65, 96, 97, 98.....	Taylor, Ira .....	" .....	.....
66, 108, 109.....	Lithgow, J. C.....	" .....	.....
67, 68	McDonald, W. B.....	" .....	.....
69.....	McInnis, Hector, et al.....	" .....	.....
70, 71, 72, 77, 78, 79, 80	Roche, William, et al.....	" .....	.....
73, 74, 75, 76	Townsend, Silas, est. ....	" .....	.....
81, 110.....	Caldwell, Thomas, et al.....	" .....	.....
82, 85, 88	Andrews, J. W. ....	" .....	.....
89, 84, 83, 86, 87, 90, 91, 92, 93, 94, 95.....	Sherman, Chas. E. ....	" .....	.....
34, 39, 40, 41, 42	Ross, Wm., et al.....	Richmond ....	.....
7	Terminal City Co. ....	" .....	.....
5, 36	N. Am. C & D. Co., Ltd. ....	" .....	.....
3	Reynolds, W. K., et al .....	" .....	.....
20, 21, 22, 23, 28, 30.....	Pearl, H. M.....	" .....	.....
35, 43	Dominion Coal Co .....	" .....	.....
11, 31, 33, 37	Richmond M. & T. Co .....	" .....	.....
24, 27	Frost, H. F.....	" .....	.....
6	Jenkins, T. K., est.....	Colchester.....	.....

COAL. — SALES.

NAMES.	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Year 1904.	Year 1903
NOVA SCOTIA :						
By Land.....	141,335	237,294	213,077	184,959	776,665	545,085
By Sea.....	226,327	130,364	118,841	143,396	618,928	1,060,392
Total N. S.	367,662	367,658	331,918	328,355	1,395,593	1,605,477
New Brunswick..	104,563	89,380	104,153	116,441	414,537	376,722
Newfoundland ...	39,358	8,655	36,343	42,782	127,138	133,162
P. E. Island	24,697	.....	23,238	32,206	80,141	78,472
Quebec	315,814	86,950	609,446	718,738	1,730,948	1,403,916
West Indies.....	.....	.....	.....	.....	.....	.....
United States....	233,193	184,735	157,401	137,841	713,170	968,832
Other Countries ..	59,533	.....	9,606	13,943	83,082	54,493
Total	1,144,820	737,378	1,272,105	1,390,306	4,544,609	4,621,074

COAL — GENERAL STATEMENT.

1904	Produce.	Sales.	Colliery Consumption.	
			Engines.	Workmen.
1st Quarter.....	1,380,623	1,144,820	95,043	23,338
2nd "	1,064,555	737,378	90,369	31,826
3rd "	1,414,465	1,272,105	95,381	14,131
4th "	1,387,492	1,390,306	87,605	11,516
Total	5,247,135	4,544,609	368,398	80,811

PRODUCTION AND SALES BY COLLIERIES.

YEAR ENDED SEPTEMBER 30TH, 1904.

COLLIERY.	PLACE.	PRODUCTION.	SALES.	COLLIERY CONSUMPTION.	
				ENGINES.	WORKMEN.
Maritime Coal Co.....	Chignecto	45911	40712	3440	940
Fundy Coal Co.....	Lower Cove Joggins.....	9037	7348	1102	162
Canada Co. Ry. Co.....	Joggins	39911	26848	3007	1129
Minudie Coal Co.....	Minudie.....	38371	35435	2011	924
Ripley and Blenkhorn.....	Maccan	1896	1554	210	112
Cumb. Ry. and Coal Co.....	Springhill	489687	423443	40217	10675
Strathcona Coal Co.....	R. Hebert.....	6791	5953	594	244
Acadia Coal Co.....	Stellarton	325837	271223	46283	7574
Interecolonial Coal Co.....	Westville.....	265560	243140	18975	4938
N. S. S. and Coal Co.....	Marsh	62611	58224	4575	
Dominion Coal Co.....	Glace Bay.....	3117648	2777452	175092	35957
Gowrie and Blockhouse Collieries.....	Port Morien	40399	29120	5906	1223
N. S. Steel and Coal Co.....	Sydney Mines.....	492604	391070	35286	11056
Sydney Coal Co.....	North Sydney.....	9349	8769	71	177
C. B. C. M. Co.....	New Campbellton.....	6274	4927	800	565
Port Hood Coal Co.....	Port Hood.....	81765	70536	8393	1588
Mabon Coal Mining Co.....	Mabon Mines	5000	141	3629	275
Inverness Ry. Coal Co.....	Broad Cove.....	208484	148814	18207	3272
Total.....		5247135	4544609	368398	80811

MINES REPORT.

TABLE A—COAL TRADE BY COUNTIES FOR THE YEAR ENDED SEPTEMBER 30TH, 1904.

	CUMBERLAND.		PICTOU.		CAPE BRETON.		OTHER COUNTRIES.		TOTAL.	
	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.
1st Quarter.....	157,600	137,277	180,972	156,032	960,701	787,921	81,350	63,590	1,380,623	1,144,820
2nd "	138,074	109,812	160,030	135,270	726,535	460,677	39,916	22,619	1,064,555	737,378
3rd "	177,166	154,505	159,825	140,659	996,911	918,962	80,563	57,979	1,414,465	1,272,105
4th "	158,764	139,697	153,181	140,626	975,853	1,029,753	99,694	80,230	1,387,492	1,390,306
Total.....	631,604	541,291	654,008	572,587	3,660,000	3,206,313	301,523	224,418	5,247,135	4,544,609

TABLE B. — COAL TRADE BY COUNTIES.

	CUMBERLAND.	PICTOU.	CAPE BRETON.	OTHER COUNTIES.	TOTAL.
Nova Scotia — By land.....	106,822	319,304	300,496	50,043	776,665
By sea.....	14,411	20,386	523,255	60,876	618,928
Total.....	121,233	339,690	823,751	110,919	1,395,593
New Brunswick	221,719	60,721	107,760	24,337	414,537
Newfoundland .....	.....	.....	122,791	4,347	127,138
P. E. Island.....	.....	36,544	32,928	10,669	80,141
Quebec	129,507	120,904	1,406,625	73,912	1,730,948
West Indies .....	.....	.....	.....	.....	.....
United States.....	68,832	14,728	629,423	187	713,170
Other countries.....	.....	.....	83,035	47	83,082
Total	541,291	572,587	3,206,313	224,418	4,544,609

Expenditure of Coal Mines of Nova Scotia for year ended September 30th, 1904.

NAME.	Shafts	Slopes	Levels	Machinery	Colliery Building	Dwelling	Wharves	Prospecting	Railways	Miscellaneous	Total.
Chignecto Colliery.....	.....	\$4238	\$7516	\$ 2168	\$2749	\$12037	.....	\$1170	\$2850	.....	\$32728
Fundy Coal Co.....	\$ 535	2007	9823	1460	75	.....	.....	.....	1128	82	15110
Joggins.....	2042	.....	1824	1128	.....	.....	.....	.....	.....	.....	4994
Mimdie Coal Co.....	.....	162	1299	352	59	.....	.....	.....	.....	.....	1872
Springhill Colliery.....	.....	.....	.....	20000	9900	50000	.....	.....	.....	.....	79900
Srathcona Coal Co.....	.....	470	897	704	31	46	1268	126	55	480	4077
Acadia Coal Co.....	54956	.....	.....	44427	4025	1928	40527	.....	666	.....	146529
Intercolonial Coal Co.....	.....	.....	1701	41576	10315	.....	18458	339	14027	411	80827
Nova Scotia Steel & Coal Co.....	.....	1845	6028	.....	.....	.....	.....	.....	.....	.....	7873
Dominion Coal Co.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gowrie & Blockhouse Collieries.	2226	7834	3214	6335	3407	.....	1038	352	.....	407	24813
Nova Scotia Steel & Coal Co.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sydney Coal Co.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pt. Hood Coal Co.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	389	389
Mabou Coal M'g Co.....	.....	2022	4050	.....	.....	.....	.....	.....	.....	.....	6072
Broad Cove Colliery.....	.....	15107	26216	11953	1788	14911	.....	72	.....	10724	80771
New Campbellton.....	228	1239	1291	453	150	200	.....	.....	93	1147	4801
	\$59987	\$34924	\$63859	\$130556	\$32499	\$79122	\$61291	\$2059	\$18819	\$13640	\$496756

MINES REPORT.

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COAL.

NOVA SCOTIA EXPORTED TO THE UNITED STATES

Years.	Tons.	Duty.	Years.	Tons.	Duty.
1850	118173	24 ad.	1877	118216	75
1851	116274	24 ad.	1878	88495	"
1852	87542	24 ad.	1879	51641	"
1853	120764	24 ad.	1880	123423	"
1854	139125	Free.	1881	113728	"
1855	103222	"	1882	99302	"
1856	126152	"	1883	102755	"
1857	123335	"	1884	64515	"
1858	186743	"	1885	34483	"
1859	122720	"	1886	66003	"
1860	149289	"	1887	73892	"
1861	204457	"	1888	30198	"
1862	192612	"	1889	29986	"
1863	282775	"	1890	50854	"
1864	347594	"	1891	25431	"
1865	465194	"	1892	13883	"
1866	404252	"	1893	16099	"
1867	338492	\$1.25	*1894	79837	40
1868	228132	"	†1895	73097	"
1869	257485	"	†1896	174919	"
1870	168180	"	‡1897	106279	67
1871	165431	"	1898	98027	"
1872	154092	75	1899	153188	"
1873	254760	"	1900	624273	"
1874	138336	"	1901	590086	"
1875	89746	"	1902	751382	"
1876	71634	"	1903	963832	"
			1904	713170	"

NOTE.—The quantities given for the years 1852 to 1872 are on the authority of the Board of Trade, Philadelphia, and are probably under-estimated.

*Nine months only.

†NOTE.—After August 1st, 1894, duty on Round Coal 40 cents, on Culm or Slack, 15 cents.

‡Fiscal year begins October 1st, and ends Sept. 30th. (Cap. 4, Acts 1893.)

||On July 24th, 1897, the duty was made 67 cents.

NOVA SCOTIA COAL SALES, 1785 TO 1904 (INCLUSIVE).

Year.	Sales.	Total.	Year.	Sales.	Total.
1785	1,668	14,349	1841	148,298	Forward 1,203,150
1786	2,000		1842	129,708	
1787	10,681		1843	105,161	
1788			1844	108,482	
1789			1845	150,674	
1790			1846	146,506	
1791	2,670	1847	201,650	1,533,793	
1792	2,143	1848	187,643		
1793	1,926	1849	174,592		
1794	4,405	1850	180,084		
1795	5,320	1851	153,499		
1796	5,249	1852	188,076		
1797	6,039	1853	217,416		
1798	5,948	1854	234,812		
1799	8,947	1855	238,215		
1800	8,401	1856	253,492		
1801	5,755	51,048	1857	294,198	2,399,319
1802	7,769		1858	226,725	
1803	6,601		1859	270,293	
1804	5,976		1860	322,592	
1805	10,130		1861	326,429	
1806	4,938		1862	395,637	
1807	5,119		1863	429,351	
1808	6,616		1864	576,935	
1809	8,919		1865	635,186	
1810	8,609		1866	558,520	
1811	8,516	70,452	1867	471,185	4,927,339
1812	9,570		1868	453,624	
1813	9,744		1869	511,795	
1814	9,866		1870	568,277	
1815	9,336		1871	596,418	
1816	8,619		1872	785,914	
1817	6,284		1873	811,106	
1818	7,920		1874	749,127	
1819	8,692		1875	706,795	
1820	9,930		1876	634,207	
1821	11,308	91,527	1877	697,645	7,317,430
1822	7,512		1878	693,511	
1823	27,000		1879	688,628	
1824			1880	954,659	
1825			1881	1,035,014	
1826	12,600		1882	1,250,179	
1827	12,149		1883	1,297,523	
1828	20,967		1884	1,261,650	
1829	21,935		1885	1,254,510	
1830	27,269		1886	1,373,666	
1831	37,170	140,820	1887	1,519,684	13,910,136
1832	50,369		1888	1,576,692	
1833	64,743		1889	1,755,107	
1834	50,813		1890	1,786,111	
1835	56,434		1891	1,849,945	
1836	107,593		1892	1,752,934	
1837	118,942		*1893	1,485,914	
1838	106,730		+1894	2,019,742	
1839	145,962		1895	1,831,357	
1840	101,198		1896	2,047,133	
		839,954	1897	3,013,421	20,552,526
			1898	2,135,397	
			1899	2,419,137	
			1900	2,997,546	
			1901	3,119,335	16,183,644
			1902	3,898,626	
			1903	4,621,074	
			1904	4,544,609	
				Total.....	

SUMMARY.

1785 to 1790.....	14,349	1841 to 1850.....	1,533,798
1791 to 1800.....	51,048	1851 to 1860.....	2,399,319
1801 to 1810.....	70,452	1861 to 1870.....	4,927,339
1811 to 1820.....	91,527	1871 to 1880.....	7,317,430
1821 to 1830.....	140,820	1881 to 1890.....	13,910,136
1831 to 1840.....	339,954	1891 to 1904.....	36,736,170

*Nine months only. +Fiscal year begins Oct. 1st and ends Sept. 30th. (Chap. 4, Acts 1893.)

PRODUCTION OF GOLD FROM 1862 TO 1904.

MINES REPORT.

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DISTRICT.	TONS CRUSHED.	TOTAL YIELD OF GOLD.			AVERAGE YIELD OF GOLD PER TON.			VALUE \$19 PER OZ.
		Oz.	Dwts.	Gr.	Oz.	Dwts.	Grs.	
Caribou and Moose River	165092	52104	15	17	.....	6	7	989992
Montague	28194	41623	6	3	1	9	13	790812
Oldham	51207	54737	11	9	1	1	9	1040014
Renfrew	51637	44955	2	19	.....	17	10	851148
Sherbrooke	290117	151002	2	6	.....	10	9	2869040
Stormont	276913	83018	4	14	.....	6	0	1577346
Tangier	50322	23895	4	15	.....	9	10	454009
Uniake	62933	43338	17	17	.....	13	18	823439
Waverley	155520	69978	6	1	.....	9	0	1329588
Brookfield	80097	33574	4	18	.....	8	9	637911
Salmon River	118440	41699	10	20	.....	7	1	792292
Whiteburn	6782	9710	8	18	1	8	15	184498
Lake Catcha	26668	26286	18	12	.....	19	17	499452
Rawdon	12189	9606	5	10	.....	15	18	182519
Wine Harbor	67954	33109	6	11	.....	9	18	629077
Fifteen Mile Stream	36456	17058	15	5	.....	9	8	324116
Malaga	20896	19293	11	7	.....	18	11	366577
Other Districts	115507	64160	0	10	.....	11	3	1219040
Total	1616924	819152	12	20	.....	10	3	15563900

GENERAL GOLD STATEMENT — Year Ended Sept 30th, 1904.

DISTRICT.	TONS CRUSHED.	TOTAL YIELD OF GOLD.			AVERAGE YIELD OF GOLD PER TON.		
		Oz.	Dwt.	Grs.	Oz.	Dwt.	Grs.
Stormont	11767	1037	8	5	0	1	18
Sherbrooke	11297	1564	17	12	0	2	18
Renfrew	701	185	0	0	0	5	7
Wine Harbor	5133	1681	3	10	0	6	13
Leipsigate	6394	1680	14	0	0	5	6
Harrigan Cove	803	269	3	0	0	6	17
North Brookfield	10534	3297	0	19	0	6	6
Waverley (No crushing)							
Caribou	10592	1856	19	12	0	3	12
Oldham	552	804	9	18	1	9	4
Uniacke	2349	975	19	18	0	8	7
Lake Catcha	97	113	13	15	1	3	11
Kemptville	130	8	15	0	0	1	8
Other Districts	2267	804	4	1	0	7	2
Total	62616	14279	18	14		4	13

MINES REPORT.

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MONTHLY STATEMENT FOR EACH GOLD DISTRICT.

Month.	STORMONT.					SHERBROOKE.				
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Dwt.	Grs.
October	No	Crushing				3	1734	229	9	0
November	1	600	108	0	0	3	1795	257	7	0
December	1	550	136	5	0	2	1928	253	19	0
January	1	475	96	5	0	3	2150	207	15	12
February	1	700	103	0	0	2	757	107	10	0
March	No	Crushing.					No	Crushing.		
April	No	Crushing.					No	Crushing.		
May	1	7910	203	1	1	1	461	35	0	0
June	No	Crushing.				2	288	13	0	0
July	1	436	97	4	0	1	1236	199	12	0
August	1	697	181	3	0	1	365	169	5	0
September	2	399	112	10	4	1	580	92	0	0
Total		11767	1037	8	5		11297	1564	17	12

MINES REPORT.

MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MONTH.	RENEW.					WINE HARBOR.				
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Dwt.	Grs.
October .....	.....	No	Crushing.	0		2	250	74	0	0
November	1	65	34		0	1	150	41	0	0
December .....	.....	No	Crushing.			2	600	260	0	0
January .....	.....		do			2	966	351	5	0
February .....	.....		do			2	750	246	0	0
March .....	.....		do			2	516	117	3	10
April	1	200	51	0	0	2	365	97	0	0
May	1	226	82	0	0	2	141	58	15	0
June .....	.....	No	Crushing.			2	326	121	0	0
July .....	.....		do			1	344	103	0	0
August .....	.....		do			1	360	113	0	0
September	1	200	18	0	0	1	365	99	0	0
Total	701	185	0	0		5133	1681	23	10

MINES REPORT.

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MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MONTH.	* LEIPSIGATE.				HARRIGAN COVE.					
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Gr.			Oz.	Dwt.	Gr.
October	1	791	86	0	0	3	266	44	7	0
November.....	1	733	73	4	0	2	88	18	1	0
December	1	420	191	16	0	1	73	19	5	0
January	1	713	249	0	0	1	43	61	0	0
February	No	Crushing.				1	53	61	0	0
March.....	1	327	132	15	0	1	57	18	0	0
April	1	316	106	5	0	2	58	14	0	0
May.....	1	186	115	14	0		No	Crushing.		
June	1	606	125	18	0		No	Crushing.		
July	1	660	151	10	0	1	65	6	10	0
August.....	1	790	212	6	0	1	55	11	0	0
September	1	852	236	6	0	1	45	16	0	0
Total		6394	1680	14	0	.....	803	269	3	0

* Leipsigat—Of 6394 tons mentioned as crushed, 3426 tons were tailings treated by Cyanide Process. Mint returns show that the Gold from the 6394 tons above mentioned contained 282 oz., 16 dwt., 0 grs. of Silver.

MINES REPORT.

MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

Month.	NORTH BROOKFIELD.				WAVERLEY.					
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Dwt.	Grs.
October	1	670	441	9	0	No crushing.				
November	1	816	298	7	0					
December	1	952	261	0	0					
January	1	978	158	11	0					
February	1	767	177	0	0					
March	1	765	202	0	0					
April	1	741	210	16	4					
May	1	816	361	8	10					
June	1	970	516	0	0					
July	1	807	216	9	5					
August	2	956	251	15	14					
September	2	1296	202	4	10					
Total	10534	3297	0	19					

MINES REPORT.

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MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MONTH.	CARIBOU.				OLDHAM.					
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Dwt.	Grs.
October	4	849	170	10	12	2	107	103	18	0
November	2	511	69	12	0		No	Crushing.	10	18
December	3	752	204	11	0	Mortared.	No	1		
January	1	685	196	0	0		No	Crushing.		
February	1	742	184	0	0		No	Crushing.		
March	1	520	73	0	0	1	69	152	0	0
April	1	692	74	0	0		No	Crushing.		
May	3	855	111	18	0	2	30	71	5	0
June	2	717	179	8	0	1	10	5	0	0
July	2	935	165	5	0	2	105	218	0	0
August	3	1734	265	10	0	2	177	238	7	0
September	2	1600	163	5	0	1	54	14	9	0
Total .....	.....	10592	1856	19	12	.....	552	804	9	18

MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MONTH.	UNIACKE.				LAKE CATCHA.					
	No of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Grs.	Dwt.
October		No	Crush ing.	0	0		No	Crush ing.		
November	1	175	59	0	0		No	Crush ing.	6	15
December	2	480	206	6	0	2	26	25		
January	2	373	128	17	0		No	Crush ing.	14	0
February	3	274	138	7	0	1	4	2		
March	2	225	104	3	0		No	Crush ing.		
April	2	178	80	7	0	1	11	24	10	0
May	2	113	58	9	0	1	10	11	9	0
June	2	235	71	5	18		No	Crush ing.		
July	1	100	47	0	0	2	34	33	14	0
August	2	142	60	1	22		No	Crush ing.		
September	1	54	22	3	2	1	12	16	0	0
Total	2349	975	19	18	97	113	13	15

MINES REPORT.

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MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MONTH.	KEMPTVILLE.				OTHER DISTRICTS.					
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Dwt.	Grs.
October		No	Crush	ing.		4	33	22	10	0
November		"	"			1	66	13	12	0
December		"	"			3	71	28	14	0
January		"	"			1	90	30	5	21
February		"	"			1	140	31	7	22
March		"	"			3	135	53	17	10
April		"	"			1	100	37	9	0
May		"	"			2	432	179	6	6
June		"	"			3	100	27	7	6
July	1	100	4	0	0	4	329	90	4	3
August		No	Crush	ing.		5	226	84	6	20
September	1	30	4	15	0	6	545	205	13	9
Total		130	8	15	0	.....	2267	804	14	1

INTERCOLONIAL RAILWAY.

Statement showing number of tons of coal received at the following stations from mines in Nova Scotia during the year ended September 30th. 1904.

Destination.	Tons.	Destination.	Tons.
Halifax.....	36880	<i>Brought forward</i>	
Dartmouth.....	22250	Point Tupper.....	50
Waverley	143	Cleveland.....	16
Rockingham.....	65	River Denys.....	48
Bedford.....	1033	Orangedale	88
Windsor Junction....	25108	Iona	976
Wellington	21	Grand Narrows.....	188
Enfield	187	Shenacadie.....	48
Elmsdale.....	846	Christmas Island.....	90
Milford.....	7	Boisdale	24
Shubenacadie ...	223	Porters	15
Stewiacke.....	155	Barrachois	54
Brookfield	83	Scotch Lake.....	254
Truro.....	17872	George's River.....	120
Riversdale.....	7	Leitche's Creek.....	314
West River.....	52	Pt. Edward Siding..	133
Glengarry	42	Belmont	7
Hopewell.....	814	Debert	7
Ferrona Junction....	40736	East Mines.....	111
Stellarton.....	8917	Londonderry	62792
Westville	3850	Wentworth	23
Sylvesters	655	Westchester.....	7
New Glasgow.....	14360	Thomson	14
Trenton.....	95903	Oxford Junction....	7
Pictou Landing.....	57495	Oxford	1976
Merigomish	269	Pugwash	2137
Avondale.....	104	Wallace Bridge.....	20
James River.....	105	Wallace	277
Antigonish.....	3790	Malagash.....	67
South River.....	14	Tatamagouche.....	421
Pomquet.....	7	Urquhart's.....	7
Heatherton.....	41	Denmark.....	113
Bayfield	51	Wilson's.....	13
Tracadie.....	61	River John.....	578
Har. au Bouche.....	82	Meadowville.....	118
Mulgrave	885	Tannery Siding.....	135
<i>Carried forward</i>		<i>Carried forward</i>	

INTERCOLONIAL RAILWAY.—(Continued.)

Destination.	Tons.	Destination.	Tons.
<i>Brought forward</i>		<i>Brought forward</i>	
Scotsburn	1493	Metapedia	2640
Scotch Hill	146	Cedar Hall	30
Haliburtons'	33	St. Flavie	216
Pictou	16001	Rimouski	176
Athol	39	River du Loup	5999
Maccan	7	St. Andre	22
Nappan	14	St. Paschal	47
Amherst	35861	River Ouelle	34
Aulac	156	St. Denis Wharf	34
Sackville	7231	L'Islet	22
Dorchester	1943	Montmagny	106
College Bridge	1296	St. Henri Jct	35737
Memramcook	287	Chaudiere Junction ..	466
Painsec	484	“ Curve	44
Shediac	895	Davis Siding	154
Pt du Chene	8	Levis	1511
Moncton	18762	Villeroi	727
Salisbury	2271	Drummondville	28
Petitcodiac	522	St. Rosalie	116
Anagance	7	St. Hyacinthe	3437
Penobsquis	7	Beloeil	286
Sussex	1886	St. Lambert	933
Hampton	457	Montreal	23701
Nauwigewauk	7	G. T. R. via Montreal ..	370
Quispamsis	7	“ “ St. Ros	1306
Rothsay	164	“ “ Chaudiere	1824
Coldbrook	21	“ St. Lambert	22
St. John	74648	C. P. R. “ St. Rosalie ..	265
Coal Branch	28	“ “ St. John	1569
Adamsville	18	Total	665192
Kent Junction	723		
Chatham Jct	10764		
Millertown	156	SUMMARY FROM	
Indiantown	22	Stellarton	238086
Newcastle	64	Westville	27308
Gloucester Jct	1518	New Glasgow	70951
Bathurst	21	Albion	41060
New Mills	88	N. Sydney	54140
Dalhousie Jct	15	Sydney	4328
Dalhousie	389	Springhill Jct	157548
Campbellton	559	Maccan	40335
		Pt. Tupper	31436
<i>Carried forward</i>			665192

INTERCOLONIAL RAILWAY.

Statement showing quantities of coal in tons received from the different mines in Nova Scotia for the use of the Intercolonial Railway, from the 1st October, 1903, to the 30th September, 1904.

Month.	Dominion Coal Co., Sydney.	Nova Scotia S. & Coal Co., New Glasgow.	Inverness Ry. & Inverness.	Port Hood Coal Co.	Intercolonial Coal M. Co., Westville.		Acadia Coal Company, Stellarton.	Springhill Coal Mining Co., Springhill.		Maritime Coal Company, Maccan.		Strathcona Coal Company, River Hebert.		Minudie Coal Co., Riv. Hebert, Colchester.		Joggins Coal Co., Colchester.	Fundy Coal Company, Fundy.	E. Ripley & Maccan.
					Round	Run of Mine		Round	Slack	Round	Run of Mine	Round	Slack	Round	Slack			
1903																		
October ...	914	915 ¹ / ₄	1942 ¹ / ₄	60 ¹ / ₂	1285 ³ / ₄	5735 ³ / ₄	138 ¹ / ₂	4955 ¹ / ₄	1396 ³ / ₄	1951 ¹ / ₄	1459	29 ³ / ₄	324 ³ / ₄	773	1400	1400	...	41 ¹ / ₄
November ...	2400 ¹ / ₂	880 ¹ / ₂	2339	306 ¹ / ₄	3506 ¹ / ₄	7196 ¹ / ₂	111 ¹ / ₂	4923	4417	4821	1757 ¹ / ₂	...	510 ¹ / ₄	1055 ¹ / ₄	1505	1505	...	43 ¹ / ₂
December ...	5078	3712 ¹ / ₄	2794	6547 ¹ / ₄	9373 ¹ / ₄	9373 ¹ / ₄	77 ¹ / ₄	4442	4302 ¹ / ₂	175 ¹ / ₄	2642	38 ¹ / ₄	119 ¹ / ₄	1680 ¹ / ₄	1327	1327	...	62 ¹ / ₄
1904																		
January ...	4591	3648 ¹ / ₄	1916 ¹ / ₂	1500	6971 ¹ / ₄	35	6568 ¹ / ₄	2866 ³ / ₄	4113	3051 ¹ / ₄	3019	...	563	1701 ¹ / ₂	274	274	...	71 ¹ / ₂
February ...	6736 ¹ / ₄	1410 ¹ / ₂	944 ¹ / ₄	541 ¹ / ₄	5662	27 ¹ / ₄	6706	7403	3371 ¹ / ₄	233	3117 ¹ / ₄	36 ¹ / ₄	197 ¹ / ₂	821 ¹ / ₄	521	521	...	77 ¹ / ₄
March ...	7545 ¹ / ₂	237	2225	309 ¹ / ₄	8032	18 ¹ / ₂	7463 ¹ / ₄	5680	4616	244 ¹ / ₄	4272	...	925	918	814	814	...	77 ¹ / ₄
April ...	8722	51 ¹ / ₄	3410	576	8311	16	8350	3665 ¹ / ₄	7761 ¹ / ₄	215 ¹ / ₄	4166 ¹ / ₄	53 ¹ / ₂	415 ¹ / ₄	1273 ¹ / ₄	208	208	...	180 ¹ / ₂
May ...	5722	51 ¹ / ₄	3488 ¹ / ₄	936 ¹ / ₄	3613 ¹ / ₂	...	6553	4225 ¹ / ₄	7022 ¹ / ₄	277 ¹ / ₄	4063 ¹ / ₂	49 ¹ / ₄	98 ¹ / ₄	244 ¹ / ₄	403	403	...	705 ¹ / ₄
June ...	7305 ¹ / ₂	4608 ¹ / ₄	2548 ¹ / ₄	1747	1762	73 ¹ / ₂	6277 ¹ / ₄	4514	7239	275 ¹ / ₄	3067 ¹ / ₄	43 ¹ / ₄	83	129 ¹ / ₄	1627	1627	...	85 ¹ / ₂
July ...	4908 ¹ / ₂	1522	2573	1339 ¹ / ₂	1510	...	5872 ¹ / ₄	2458 ¹ / ₄	6630 ¹ / ₄	178	2674 ¹ / ₄	50 ¹ / ₂	52	228 ¹ / ₄	2365	2365	...	142
August ...	5845 ¹ / ₂	2439 ¹ / ₄	2476	7907	1091 ¹ / ₄	...	7618 ¹ / ₂	34	8360 ¹ / ₄	373	2872 ¹ / ₄	147 ¹ / ₄	149 ¹ / ₄	321 ¹ / ₄	183	183	...	53
September ...	7605 ¹ / ₄	514 ¹ / ₂	1511	7501 ¹ / ₄	262 ¹ / ₄	44 ¹ / ₄	6367 ¹ / ₄	2457 ¹ / ₄	3357 ¹ / ₄	104 ¹ / ₄	1251 ¹ / ₄	46 ¹ / ₄	614 ¹ / ₄	981 ¹ / ₄	2378	2378	...	60
Total.	67374 ¹ / ₄	19991 ¹ / ₂	20068	23706	48389	214 ¹ / ₄	87445 ¹ / ₄	50985	62621 ¹ / ₄	3100 ¹ / ₄	94633 ¹ / ₄	419 ¹ / ₄	6947 ¹ / ₄	868 ¹ / ₄	769	19067 ¹ / ₄	872 ¹ / ₄	744 ¹ / ₄

CUSTOMS CANADA.

PORT OF WINDSOR.

Statement showing amount and value of Products of the mine exported from Port of Windsor, N. S., and outports during the year ended September 30th, 1904.

	Tons.	Value.
Port of Windsor, gypsum	162210	\$162210
Outport of Cheverie do	8151	4662
do Walton, do	10805	6935
Total gypsum	181166	\$173807
Port of Windsor, moulding sand	175	\$438
Total products of the mine	181341	\$174245

[Sgd.] WILLIAM O'BRIEN, *Collector.*

CORE DRILLING

IN

NOVA SCOTIA.

A Report for the use of Drill Men, and for
the information of those interested in
the subject of Boring,

BY

D'ARCY WEATHERBE, C. E.,

A. M. CAN., SOC. C. E.,

MINES DEPARTMENT OF NOVA SCOTIA.



THE COMMISSIONER OF PUBLIC WORKS AND MINES,
KING'S PRINTER.

1904.

MINES OFFICE,
HALIFAX, N. S.,
APRIL 25TH, 1904.

THE HONOURABLE ARTHUR DRYSDALE, M. P. P.,
Commissioner of Public Works and Mines.

SIR,—As many enquiries are made as to the capabilities of the Drills bought by your Department, as to the terms on which they can be acquired, and as to the difficulties that may be met in drilling, I have directed Mr. D'Arcy Weatherbe, who has had charge of the drills, to make a general report on the Drills in the hands of the Department.

This report gives all information needed by parties desirous of getting the loan of a drill, with further details as to the duties of the Department's men in charge of the drills, the responsibilities of the parties in working the drill, etc.

Further information is given as to cost of drilling, carbons, etc. The report also contains a list of the bore-holes put down in the Province.

Trusting this report will be of public service, I respectfully submit it herewith.

And remain, yours obtl'y,

E. GILPIN, JR.,
Dy. Com. P. W. and M.

TO DR. E. GILPIN,

*Deputy Commissioner of P. W. & M.,
and Inspector of Mines.*

SIR,—

Following your instructions regarding the preparation of a report in the form of a manual for the use of those interested in core drilling, and for the instruction of the men employed by the Department in this work, I beg to submit the following memoranda and sketches, which I hope will cover the ground, and prove useful as a work of reference.

I remain,

Your obedient servant,

D'ARCY WEATHERDE, C. E.,
Mines Dept.

Introductory.

During recent years the question of Government aid to mining, has, throughout the civilized world, become one of constantly increasing importance, and has more and more occupied the time and attention of individuals, companies and societies interested in this important industry. In fact so strongly recognized a principle has it become, that in many localities special branches of the mines departments or mining bureaus are organized to look after this branch alone.

This aid has taken various forms, such as direct aid in the way of money and provisions to the prospector, remission of taxes under certain conditions, monetary and other assistance in actual mining work, the establishment of reduction works, assay offices, etc., etc., and last, but not least, the providing of core drills for the prospecting and exploitation of mineral lands.

This latter form of aid has proved to be both popular and practical in its application, and is one of the forms that the Government of Nova Scotia has adopted.

Description of Machines.

Drills were first purchased by the Nova Scotia Department of Mines in 1900, when four machines of various types were procured. This number has been augmented from time to time, and there are now seven under its direction.

The tabulated statement below gives a list of these drills, with their power, capacity and other characteristics. They are numbered consecutively, according to the dates on which they were bought :—

No. of Drill.	Type.	Nature of Power.	Boring Capacity in feet.	Diameter of core in inches.	Name of Manufacturer.
1	Calyx	Steam	1500	5	Davis Calyx Drill Co.
2	Diamond	"	900	1 $\frac{1}{10}$	*Bullock Mfg. Co.
3	"	Hand	400	1 $\frac{1}{10}$	" " "
4	"	"	400	1 $\frac{1}{10}$	" " "
5	Calyx	Steam	1500	5	Davis Calyx Drill Co.
6	"	"	3000	6 $\frac{1}{2}$	" " " "
7	"	Hand or Horse	350	1 $\frac{5}{8}$	" " " "

The general construction of the Bullock pattern of Diamond Drill does not materially differ from other standard types used, and need hardly be gone into here. The machines were of the latest pattern at the time of purchase, and have the most modern appliances in the way of bits, core shells and lifters, core barrels, etc., etc.

The Calyx drill, so-called, as perfected in the machines in possession of this Department, is a more modern invention, and has given eminent satisfaction so far as concerns the getting of cores.

A short description of its chief characteristics and advantages may be of service. The cost of producing cores with diamond bits is becoming greater every year, carbons having advanced in price at a rapid rate. In fact, less than 20 years ago they cost only \$5.00 to \$6.00 per carat, whereas in 1903 the price of picked stones was from \$60.00 to \$70.00 per carat, depending on the size of the stones. The use of large diameter bits has therefore become practically prohibited.

* The Bullock Co. have since been absorbed by the Sullivan Manfg Co.

Another factor which has tended to increase the cost of such drilling is the deterioration in the quality of the stones supplied. To produce larger cores, therefore, at a reasonable price per foot and in as satisfactory a manner as possible, the Calyx pattern of drill was perfected, and comprises a combination of steel cutter and shot process.

The cutter, which is only applicable to soft rocks, is a toothed cylindrical barrel about 18 inches in length, which cuts the rock in a chisel-like manner, and with a rotary motion of the drill.

The shot process can be applied to all rocks which are cut by the diamond, though it is not advisable in such soft or plastic rocks as slates and argillites, etc., where "mudding" is liable to take place.

In this method chilled steel shot of various sizes are fed down through the hollow drill rods, and a cylindrical steel bit rotating on top of them cuts out the core by means of the friction set up. The water escapes through flukes cut at the bottom of the bit.

An additional though inverted record of the strata formation is supplied in the Calyx or chip-cup, from which the drill takes its name; but this is seldom of practical utility. This chip-cup is simply a tube open at the top and attached to the core-barrel, and into which are washed the larger and heavier portions of the sludge as they are cut away at the bottom.

Tubular steel derricks for the hoisting of the rods are supplied with these drills, and that with No. 7 drill is 90 feet in height, thus enabling three rods to be drawn together without uncoupling. This arrangement naturally saves much time and therefore reduces the cost per foot.

Method of Obtaining the use of Drills from the Department.

Any person wishing to obtain the use of one of these drills should make application in writing to the Commissioner of Mines under the following heads :

- (1) Locality in which it is proposed to bore.
- (2) Probable depth of deepest hole and number of holes required.
- (3) Whether the boring is to be done from the surface or underground.
- (4) Nature of rock to be bored and the mineral sought.
- (5) Probable depth of surface detritus overlying bed-rock.
- (6) Is steam power or compressed air available.
- (7) Is there a good water supply at hand.
- (8) Probable time the drill will be required.

Upon his satisfying himself of the suitability of the proposition, and there being an appropriate machine available, the Commissioner will notify the applicant of the fact, and will require from him a bond, of which the following is the form.

KNOW ALL MEN BY THESE PRESENTS, that we
of.....in the county
 of.....;
of.....in the county of.....;
 of
 in the county of
 are jointly and severally held and firmly bound unto His Majesty
 the King, his heirs and successors, represented in this behalf by
 the Honourable.....Commissioner of Public Works and
 Mines for the Province of Nova Scotia and his successors in office
 in the penal sum of.....of lawful moneys of Canada, to
 be paid to the said Honourable.....his certain attorney,
 heirs and successors in office, for which payment to be well and
 truly made, we and each of us bind ourselves, our, and each of
 our heirs, executors and administrators, firmly by these presents.
 Sealed with our seal and dated the.....day of.....
 one thousand nine hundred.....

Whereas, the above bounden.....has obtained from
 the said Commissioner of Public Works and Mines, the use of a
 drill, the property of the Government of Nova Scotia, for the
 purpose of boring for minerals upon certain conditions, to wit :—

that the said.....shall pay all expense of transport from place of storage to site of bore-hole, of setting up, running, operating and maintaining the same in working order, including cost of all piping, rods, diamonds and other material found necessary, also all wages, fuel and damages, including wages of man placed in charge of drill equipment by the said the Honourable Commissioner of Public Works and Mines, and all charges of removing drill equipment from bore-hole to bore-hole, and of returning the same to such place as may be appointed by the said Honourable Commissioner of Works and Mines, and shall also keep a correct record of all strata bored through, and place the same at the disposal of the said Honourable Commissioner or his agents, and shall deliver over the drill equipment in good order to any person or persons appointed by said Honourable Commissioner to receive the same.

Now the Condition of this obligation is such that if the above bounden.....his heirs, executors or administrators, do well and truly perform and carry out on his part the conditions aforesaid, and shall pay all expense of transport of said drill from place of storage to site of bore-hole, and of setting up, running, operating and maintaining the same in working order, including the cost of all piping, rods, diamonds and other material found necessary, and also all wages, fuel and damages, including wages of man placed in charge of drill equipment by the said Honourable Commissioner of Public Works and Mines, and all charges of removing drill equipment from bore-hole to bore-hole, and of returning the same to such place as may be appointed by said Honourable Commissioner of Public Works and Mines, and shall keep a correct record of all strata bored through, and shall place the same at the disposal of the said Honourable Commissioner of Public Works and Mines or his agents, and shall deliver over the said drill equipment in good order to any person appointed by the said Honourable Commissioner of Public Works and Mines to receive it, (it being understood that such delivery in order be attested by a written acknowledgment

thereof by the said Commissioner of Public Works and Mines or his deputy,) then this obligation shall be void, otherwise the same shall be and remain in full force and effect.

Signed, sealed and delivered, }
in presence of }

I,.....of....., one of the sureties named in the foregoing bond, make oath and say :—

1. That I am a resident inhabitant of.....in the County of.....and am a freeholder there.

2. That I am worth property to the amount of.....dollars over and above what will pay my just debts and every other sum for which I am now security.

3. That my said property consists of.....situate at.....

4. That I have for the last six months resided at.....in the county of.....

Sworn at..... }
in the county of..... }
this.....day of }
A. D., 190 }
Before me }

This instrument having been properly executed (containing the names of *two* sureties, both of whom must justify,) and returned to the Commissioner's office, instructions will be sent to the Department's official in charge of the drill to transport it to the locality named, and to follow out the instructions of the applicant or his agent with regard to the positions of the boreholes, etc., although the machine and its manipulation is entirely in charge of said official under the supervision of the Commissioner.

The expenses incurred by the applicant will include the following :—

(a) The drill runner's salary, at the rate of \$75.00 per month in the case of power drills and \$60.00 in case of hand drill men, and his board and travelling expenses from time of transportation until the machine has been returned to the locality named by the Commissioner.

(b) All other labour at rates as may be mutually agreed upon by the parties concerned.

(c) All charges of transport of drill and parts (including new parts sent), moving, storage or housing of drill on the ground, from the time the machine is accepted (by the filing of the bond) until it has been returned to the place named by the Commissioner.

(d) All expenses in connection with the actual drilling, such as fuel, oil, waste, light, etc., etc.

(e) All drive pipe, casing pipe, shot and gravel used.

(f) ~~The cost of all carbons except the first bit set with six stones. All new parts and material must be ordered as well as paid for by the applicant, unless such article is part of the "regular drill equipment."~~

When required by the Department the cores are to be preserved under the supervision of the drill runner, until inspected by some person appointed by the Commissioner.

The amounts to be filled in on the bond as liability in the cases of the several drills are as follows :—

No of Drill.	Amount of Bond.
1	\$ 5,000.00
2	4,000.00
3	1,500.00
4	1,500.00
5	5,000.00
6	9,000.00
7	1,500.00

Rules and Memorandum for Drill Runners.

The following circular relating to the operation of the drills by the men in charge of same, is issued by the Commissioner.—

RULES TO BE STRICTLY OBSERVED BY THOSE IN CHARGE OF THE OPERATION OF GOVERNMENT DRILLS.

1. The person placed in charge of a drill is to be under the direct supervision of the Department of Mines, and is to strictly observe any orders that may be issued to him from time to time

2. His pay is to be at the rate of \$75.00 per month with board and travelling expenses, except in the case of men in charge of a hand-drill, whose pay will be at the rate of \$60.00 per month with board and expenses. Any other arrangement between drill runner and applicant that may be *mutually* agreed upon will be satisfactory to the Department.

3. He is to be paid from the time he is sent to move the drill until such time as the drill may be accepted back by the Department.

4. The intervals at which he is to be paid are to be arranged with the applicant before drilling commences, and in case the payments are not made in accordance with said agreement he is empowered after due notice has been given to the applicant or his agent, to shut down the drill and at once notify the Commissioner; if possible by wire. This course, however, should not be adopted except in cases where he considers the payments will not be forthcoming.

5. If while in charge of drilling operations his services are required by the Department, his pay and expenses during that time will be defrayed by the Department.

6. A clear record of all boring, etc., and any incidents of useful record, such as cost of drilling, wear of parts, etc., etc., should be systematically noted in a book kept for the purpose, (preferably in diary form.)

7. Unless specifically requested, and in which case no responsibility will be borne by the Department, the selection of the positions of all bore-holes are to be made by the applicant, and such positions are to be accepted by the drill runner, except in cases where he considers the drill or any part thereof to be endangered.

These conditions are also to be followed out with regard to the depth and the number of holes required.

8. He is to preserve the cores in their order, and when necessary, or when so instructed by the Commissioner, he is to have them placed in rough boxes made for the purpose.

9. All orders for material, except when otherwise instructed by the Commissioner, are to be forwarded to him by the drill man for approval, and through him transmitted to the party supplying same, and care should be taken in ordering to send notice before hand of any part which may be required to be renewed in a short time.

10. He is to require the applicant where necessary to supply casing or drive pipe, and in case this is not done, or in any case where he considers further drilling will endanger the machine, he is to at once shut it down and notify the Commissioner.

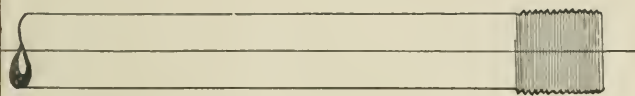
11. He is to make a careful inventory of the equipment and all parts, on the drill being forwarded to an applicant, and again on its being handed over to the Department, or being returned to the store-house.

12. Any expense herein entailed, or in connection in any way with the drilling operations other than for *bona fide* renewals or repairs to *what is considered by the Department part of the regular drill equipment*, is to be borne by the applicant. Shot, gravel and carbons (other than those supplied with the first bit in each case) are not considered part of the regular equipment.

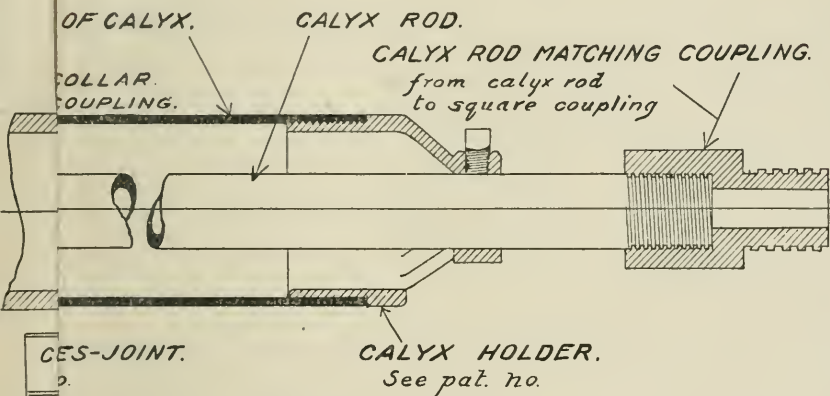
13. He is to return to the Commissioner promptly on the dates specified, all forms, such as bore-hole records, cost sheets, etc., and any special forms, properly filled in, and these forms are to be

returned even when no work has been done, the facts and reasons being noted thereon, and he is to further notify the Commissioner in case of any accident to the drill or its parts or any stoppage in the boring.

The two plates inserted here may be used in ordering materia through the Commissioner, and the names and numbers of parts as shown on the plates are always to be given in the order.



MIUM OR SHORT.



GES-JOINT.

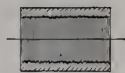
CALYX HOLDER.
See pat. no.

PARTS FOR NOVA SCOTIA GOVERNMENT
DRILLS NUMBERS, 1, 5, AND 6.
DAVIS CALYX DRILL CO.
128 B'WAY, NEW YORK.

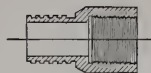
(All Sizes)
MENT DRILL.

J. H. C.

E-357



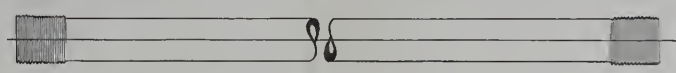
SLEEVE COUPLING.



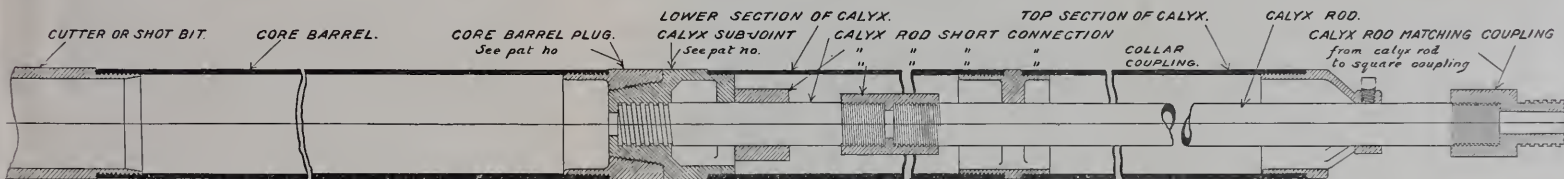
SERRATED COUPLING



SQUARE COUPLING.



DRILL ROD; LONG, MEDIUM OR SHORT.



CORE BARREL PLUG Old Style	PAT NO	CALYX SUB-JOINT Old Style	PAT NO	CALYX SERIES-JOINT	PAT NO	CALYX HOLDER	PAT NO
4 INCH	T-2	4 INCH	T-3	4 INCH	T-4	4 INCH	T-5
5 "	T-6	5 "	T-7	5 "	T-8	5 "	T-9
6 "	T-22	6 "	T-23	6 "	T-24	6 "	T-25
7 "	T-26	7 "	T-27	7 "	T-28	7 "	T-29
8 "	T-32	8 "	T-33	8 "	T-34	8 "	T-35

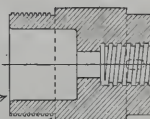
NOTE.

ALWAYS GIVE NUMBER OF THE DRILL
THAT PARTS ARE WANTED FOR.

NOTE,

USED IN PLACE OF THE TWO
PARTS; CALYX SUB-JOINT AND
CORE BARREL PLUG; SHOWN IN
ABOVE ASSEMBLED VIEW.

NOTE, CORE BARREL PLUG (All Sizes)
USED ON #6 GOVERNMENT DRILL.



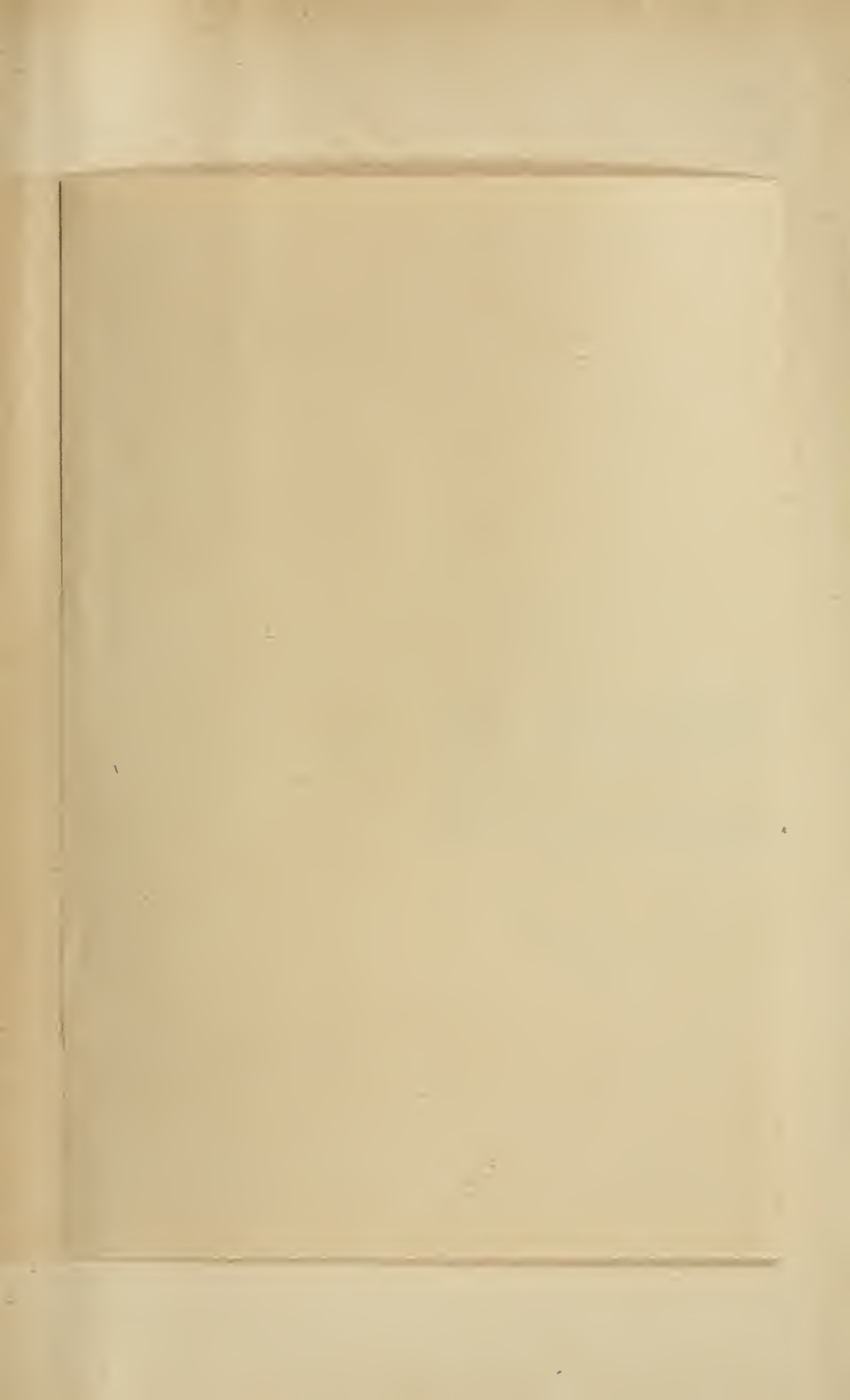
CALYX SERIES-JOINT.
See pat. no.

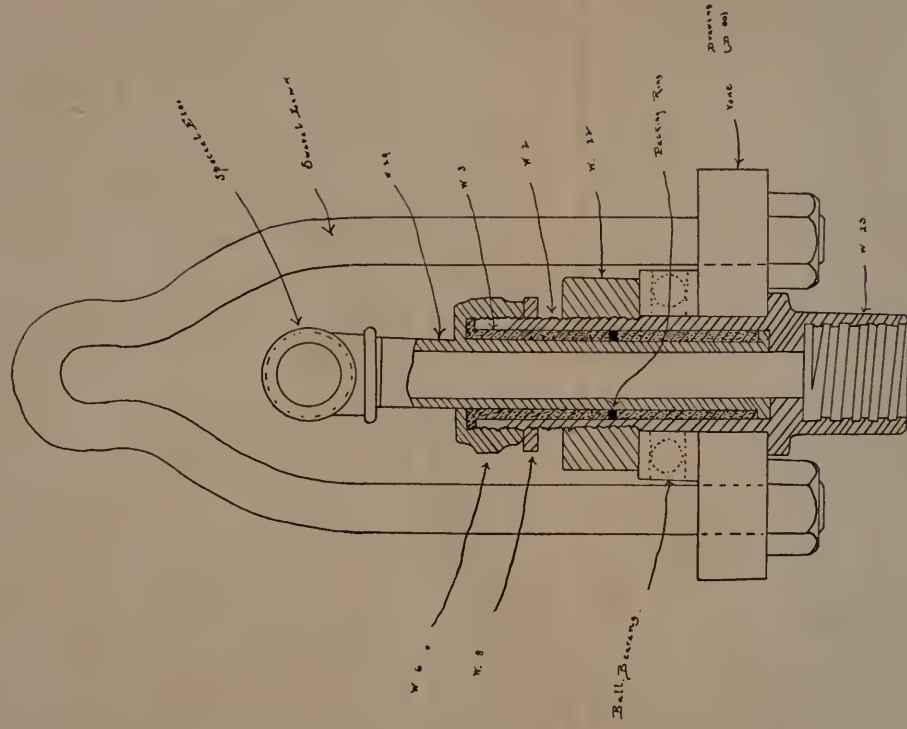
CALYX HOLDER.
See pat. no.

PARTS FOR NOVA SCOTIA GOVERNMENT
DRILLS NUMBERS, 1, 5, AND 6
DAVIS CALYX DRILL CO.
128 B'WAY, NEW YORK.

J.H.C.

E-357





Miscellaneous Notes.

VERTICALITY OF BORE-HOLES AND METHODS OF DETERMINING DIPS.

A source of great annoyance, which often occasions loss of time and money, and to which the attention of drillers might with advantage be directed, is the occurrence of crooked bore-holes.

It is generally assumed when calculating results that bore-holes are truly vertical. Experience has however proved this not always to be the case, the deviation being sometimes so great as to render a bore-hole record altogether misleading. Many proved instances of this are known; notably in Galicia and in the Australian colony of Victoria, where highly inclined strata were encountered. In the latter locality in one case a deviation as great as 75 feet in 500 feet of depth was found.

It is usual in such cases to fill up the crooked part of the hole with scraps of iron or cement which is allowed to set.

The Davis Calyx Drill Company, with reference to crooked bore-holes, say in effect:—

“We believe the best way to straighten a hole would be to fill it to a point two or three feet above where it begins to run off with a mixture of about two parts of sand to one of cement, if the hole is full of water, or if the hole is dry, with about three parts of sand to one of cement. Portland cement would probably give the best result.

“After this is set about twenty-four hours, it should be hard enough to drill. A good quality of coarse sand should be used in making the mortar. When the mortar has set, it should be as hard as the rock, and by drilling it carefully until the crooked part of the hole is passed little trouble should be experienced in straightening it.

“Crooked holes are often caused by too much weight on the tools and by the calyx being left off. Too much weight on the tools would cause the rods to bow out very much and cause the hole to become badly out of shape. The calyx should be used as

it makes a so much longer bearing that it steadies the boring tools, thus making it very much easier to keep the hole straight."

If the rock is soft by setting all the teeth out on the Davis cutter, it is possible to ream the hole to get casing down when required.

If, however, an accurate survey of the bore hole can be made it is just as useful as one truly vertical.

The following extract from "Boring and Drilling" will explain the methods of doing this.

"The most effective method of surveying a bore-hole is that devised by Mr. E. F. McGeorge, an Australian Engineer. Clear glass phials, nearly filled with a hot solution of gelatine, and each containing a magnetic needle and a plummet in suspension, are encased in a brass protecting tube, and let down to the depth required. After remaining for several hours until the gelatine sets, the phials are withdrawn, and can each be replaced at the same angle as that at which they cooled by means of the congealed surface seen through the sides of the phial. Revolving the phial upon the part where the magnetic needle is seen embedded in the gelatine, until the needle is again in the meridian, obviously brings the phial to the same position as it had when its contents congealed. Thus the inclination and bearing can be determined at measured intervals throughout its length. The recording instrument is somewhat similar to a theodolite, so arranged that when the phial is placed in it, the bearing can be read off.

"A less satisfactory method of surveying bore-holes has been adopted by Mr. G. Nolten, in Germany. In the instrument he employed the amount of deviation is etched upon glass by hydrofluoric acid, while its direction is found by means of a compass needle clamped by the aid of a stop watch, after sufficient time has been allowed to elapse.

"Again Mr. Trouve, the French electrician, has designed an electric lamp, with a mirror set at an angle of 45°, which is lowered down the bore-hole in order to give an image of the strata, which are examined by an observer at the surface with the aid of a telescope."

"The most recent method introduced for surveying bore-holes is that devised by Mr. G. O. McFarlane, an American Engineer. In a short steel pipe is placed a second steel pipe designed to screw on the boring rods. The bottom of the larger pipe is closed, and that of the smaller open. The former contains a bath of mercury in which is a gutta serena float carrying a magnetic needle. In the smaller pipe there are two iron wires bare to a point an inch above the surface of the mercury and then insulated. They are each joined to an insulated copper wire that passes up through the rods to the surface, where they are attached to a tangent galvanometer and a battery. According to the inclination of the bore-hole the bare wires dip more or less into the mercury, and alter the resistance of the circuit. By slowly rotating the rods in the bore-hole, the inclination is determined from the deflection of the galvanometer. The direction of the dip is determined on a similar principle with the aid of a wire leading to the surface and connected with a magnetic needle."

DIP OF STRATA.—Another point, probably more important than the above, and to which practically little importance seems to be attached by the ordinary operator in this Province, is the determination of the dip and strike of the strata bored through. Yet the entire result of an expensive set of borings may be lost through such negligence.

When the dip in a deep hole is known to be concordant with the surface conditions, it may of course be easily obtained. Otherwise it must be done, either by :—

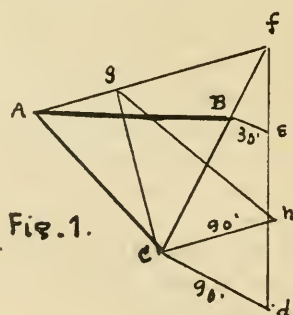
- (1) Several deep borings : or
- (2) Some specially contrived apparatus being let down into the hole, or by some such similar method.

In the first case, I beg to quote from the Coal and Metal Miners' Pocket Book, published in Scranton, Pa., as follows :—

"To obtain dip and strike from bore hole records.—

Before the results obtained from bore holes are available for use in map construction the dip and strike of the various strata must be ascertained. The process, in the case of stratified rock,

is as follows : If three holes were drilled as in Fig. 1, at A, B, and C, each intersecting a given bed the strike and angle of the dip of the bed may be reduced by reducing the results from the three holes to a plane passing through the highest point of intersection, which is at A. The hole B. intersected the bed at the distance B e and C at the distance of C d below the point A. By continuing the line C, B indefinitely, and erecting two lines B e and C d perpendicular to it, each representing the distance from the horizontal plane through A to the intersection of the strata, two points in the line d e are obtained, which line intersects C, B produced at f; f is one point in the line of strike through A. In order to find the angle of dip, the perpendicular C g is dropped from the deepest hole C upon the line of strike A f. The distance C h equal to C d is laid off at right angles to C g, when the angle C g h gives the maximum dip. The results obtained from bore-holes may thus be reduced to such form that the dips can be projected on the surface to obtain the line of outcrop for each stratum."

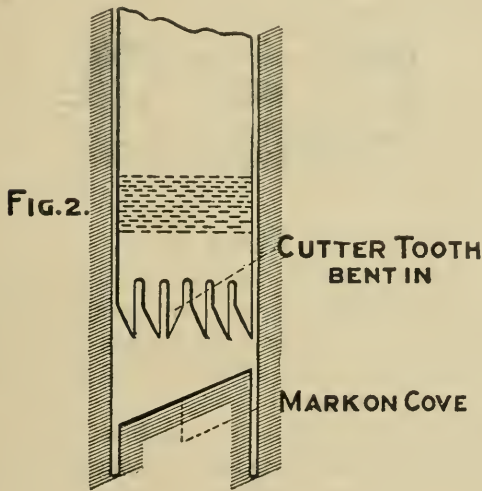


In the second case methods are used, but not with such satisfactory results, in which an appliance containing a magnetic needle, set in position automatically by a train of clockwork, is lowered into the hole by a watertight case composed of non-magnetic material.

Several designs of this instrument have been elaborated by Wolpe Kobrich and Gothan, and a full description of its application is given in "Boring and Drilling," volume 1, page 70, No. 4.

A more simple method of obtaining the direction of dip of stratified measures in bore-holes made with the Calyx Drill is as follows :—

In almost every case a piece of core is left "in situ" at the bottom of the bore-hole (Fig. 2.) the top of which represents approximately the angle and more particularly the *direction* of dip.



One of the teeth of the cutter is bent inwards just far enough to mark the piece of core as shown. (Fig. 2.)

A straight line A B Fig. 3 is marked with chalk across the centre of the top of the rotating table, and above this an indicator is firmly fastened to the derrick with its pointer almost touching the rods as they are drawn up, and consecutively uncoupled

Great care must be taken so that the point of this indicator where it touches the rods is placed in the same vertical plane as

the line across the rotating table. The rods, core-barrel and cutter are then screwed very tight, lowered into the hole and the rock marked as shown above.

In drawing and uncoupling the rods great care is taken to note any rotation of the line by means of the indicator. The cutter being finally brought up, the position of the bent tooth, (to correspond with the position of the mark on rock) is marked on the table in correct relation to the line across it. The core is then drawn and placed on the table in its original position, and thus the direction of dip can be noted.

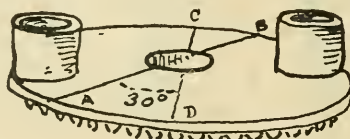


Fig. 3.

If A B be the chalk line on rotating table and A points to the north and C D represents the direction of the dip as shown by the piece of core, then the direction of the dip in this case will be N. 30° W. A method somewhat similar to this was used with success in Victoria.

This trouble of divergence in bore-holes may be greatly minimized by keeping the parts in connection with the bit up to gauge, and in the case of the larger capacity drills of the Calyx pattern, where there is often over 25 feet of close fitting, heavy and large calibre material (core-barrel, bit and chip-cup) at the bottom of the hole, the axis of the bore hole is no doubt practically vertical.

The following extract is also taken from the Miners' Pocket Book :—

"The value of the record furnished by the Diamond drill depends largely on the character of the material sought. The core extracted is always of very small volume when compared with the large mass of the formation prospected, and hence will

give a fair average sample only in the case of very uniform deposits. The value of the diamond drill for prospecting may be stated as follows: More dependence can be placed on the record furnished by the diamond drill when prospecting for materials that occur in large bodies of uniform composition, than when prospecting for materials that occur in small bunches or irregular seams. To the first class belong coal, iron ore, low-grade finely disseminated gold and silver ores, many deposits of copper, lead, zinc, etc., as well as salt, gypsum, building stone, etc. To the latter class belong small but rich bunches of gold, silver mineral, or rich streaks of gold telluride.

The arrangement of holes has considerable effect upon the results furnished. If the material sought lies in beds or seams (as coal), the dip of which is fairly well known, it is best to drill a series of holes at right angles to the formation. If the material sought occurs in irregular bunches, pockets or lenses, it will be necessary to drill holes at two or more angles, so as to divide the ground into a series of rectangles, thus rendering it practically impossible for any vein or seam of commercial importance to exist without being discovered. Where the surface of the ground is covered with drift and wash material, it may be best to sink a shaft, or drill pit to bed rock, and locate the machine on bed rock. After this, several series of fan holes may be drilled at various angles from the bottom of the pit. Owing to the upward drift of diamond-drill holes, the results furnished from a set of fan holes drilled from a single position, would make a flat bed appear as an inverted bowl or the top of a hill. On this account, it is best to drill sets of fan holes from two or more locations, so that they will correct one another. If fan holes from different positions intersect the same bed, a careful examination of them will usually furnish a check on the vertical drift of the holes."

These remarks also refer practically to the Calyx drill.

A difficulty almost universally met with through the Province consists in the unreliability of many of the records furnished by the drill men. These men, who, though often thoroughly competent as far as the mechanical part of the work is concerned, are handicapped in their want of lithological knowledge, which is generally limited to a few commonplace terms, and the fact of even these being carelessly used renders it specially difficult to utilize their

reports of the strata pierced when required for correlation purposes.

In order as nearly as possible to exactly standardize these reports it would be necessary to submit to each drill runner similar samples of cores of all rocks liable to be met with, these being properly labelled with their names, colours and other characteristics. It is hoped that this scheme will be carried out at an early date. It is not considered worth while in the meantime to supply here a list of rocks, as this, with the necessary directions regarding colour, hardness, general characteristics, and grading of classes, would probably tend only to confuse.

When an occasion offers personal instruction is given. In cases where the drill-man is unable to determine the name of a rock, he should send a small piece of the core by mail to the Department for classification.

All cores should be "read" when dry.

Diamond Drills.

CARBONS.

The chief source of supply of these is South Africa and Brazil, although India, Australia and other parts of the world supply a small percentage of the demand. Any of the above varieties, providing they are proper size and shape and free from flaws, may be used ; but the best stones are the black carbonados of Brazil, substitutions of which are often made in the shape of Corundum artificially coloured.

To avoid fraud it is always a safe precaution to thoroughly wash all new stones and examine them carefully with a glass. A tried stone may be used for comparison. Any of a brown colour should be rejected, and if doubt exists as to the genuineness of any, resort can be had to the specific gravity test.

The best stones for cutting are those nuggety in shape with well defined angular projections. Flat and indented stones should be avoided on account of their liability to fly and the difficulty of securing them in the bit.

The bort stone of South Africa is sometimes used as a makeshift, but cannot compare with the black diamond, which is generally cheaper in the long run on account of its superior molecular structure, and its proof against chipping.

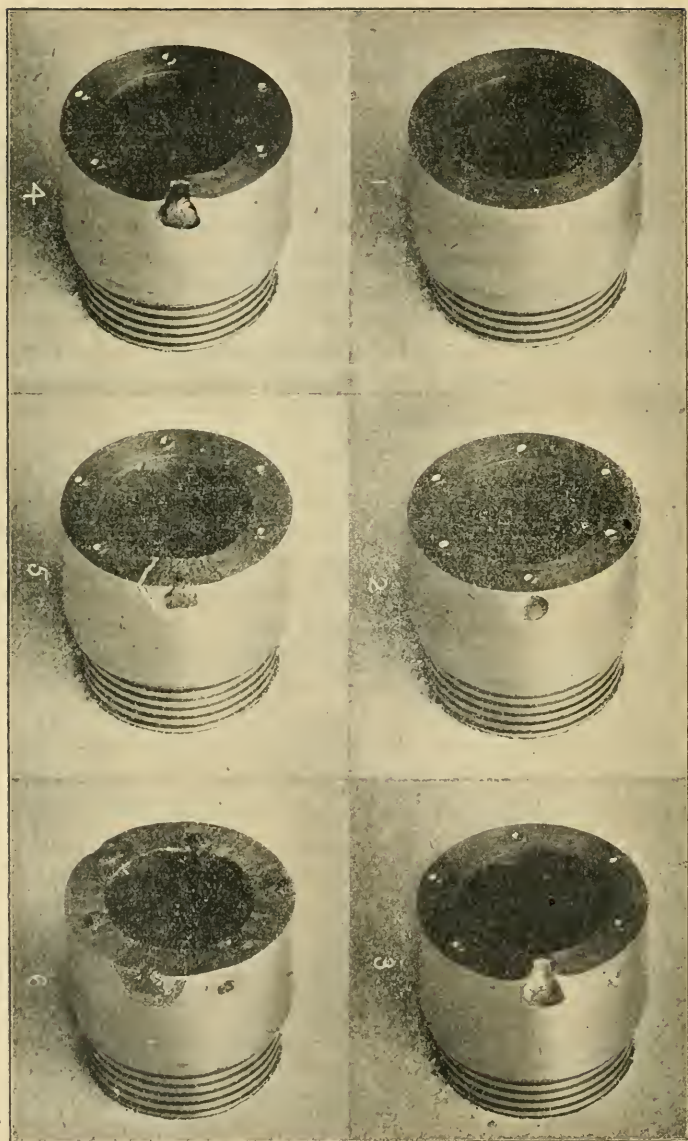
NO. OF STONES IN BIT.

The number of stones used in the setting of a diamond drilling bit varies with the diameter of the bit, and with the individual opinion of the person in charge of the drill. It has been found most economical in the case of the drills used by this Department, where the cores got are only slightly over 1 inch in diameter, to set the bits with six stones instead of eight. These are however selected carbons of $1\frac{1}{2}$ carats each.

WEAR OF CARBONS AND BITS.

The rate of wear depends on the hardness of the rock, the setting of the carbons and the care and judgment exercised in working the drill. A careful record should be kept in the drill-man's book of the rates of wear of both carbons and bit in each hole: and the number of feet bored per carat of carbon and per metal bit should be noted, and particularly the kind of rock. It should also be recorded how often in each kind of rock it is found necessary to re-caulk the bits.

The following rules for setting the bits are taken from the catalogue of the Sullivan Machinery Company, the manufacturers of the Sullivan Diamond Drills—and modified to suit the cut used:



As a general rule, it may be stated that eight stones should be used for setting a diamond bit. Very large bits are frequently set with more stones, in order to "cover," and smaller bits are set with only six stones.

The DIAMONDS should be picked out carefully, with special attention to their location in the bit and a uniformity of size and weight. This latter point is important, for a small stone set with a number of large ones will become insecure in its setting and necessitate the resetting of the entire bit long before the balance of the stones require it. As a general rule, four of the strongest stones are picked out for the outside stones.

The BIT is laid out as indicated at No. 2, for placing three stones on the outside cutting edges and three on the inside. The three outside stones are placed on lines at equal angles. Laid out in this manner and carefully set, the bit will be well balanced and cannot but run smoothly and true.

After selecting a stone for a certain position, a hole is drilled with a twist drill smaller than the stone (see No. 2); then by the use of the small chisels and caulking tools, the metal of the bit is chipped away and caulked back to conform as closely as possible to the size and shape of the stone, as shown at No. 3. Especial care should be taken to see that the stone "seats" perfectly and that it is up to gauge on the face of the bit as well as on the side.

Our bit blanks are made exactly to gauge, and it is therefore safe to take them as a gauge in setting, the stones setting just flush with the face and set with a clearance on the side, as will be required by the nature of the rock.

After the cavity has been properly formed to receive the stone, it is put into place, and by means of the caulking tools and punches the metal of the bit is drawn back around the stone, fastening it firmly. Two heavy chisel cuts are usually made a short distance from the stone across the face of the bit and these are used as starting points from which to draw the metal over. In caulking the metal over, be careful not to throw the stone out

of position, either by crowding it down or to one side, or forcing it too high on the cutting face. A little time exercised on this point when first starting is well spent. Be careful not to strike the diamond with the hammer or the caulking tool; the diamond will stand a very heavy steady *pressure*, but will be shattered by a very slight *blow*. Caulk the metal in evenly all around the diamond; *i. e.*, do not caulk the metal closely upon one side and then on the other, but work carefully clear around the stone, bringing the metal together in a body as closely as possible. If the stone is so irregular that in order to get it into place in the bit it is necessary to chip away a large amount of metal, so that there is not sufficient metal to fill in when caulked back, a small piece of copper or horse-shoe nail can be used for filling, in and then leave enough metal to permit of caulking firmly into place.

When setting the inside stones, it is well to take a small piece of tin or sheet iron, bent properly to cover half of the face of the bit, and place it over the stones that have been set opposite the stone being worked on; this will often prevent the breakage of a stone through the slipping of a hammer or tool.

The proper amount of clearance for the stones depends upon the character of the rock. For very hard rocks, which hold together well and are not apt to clog, a clearance of one-sixty-fourth of an inch on each outside stone, making one-thirty-second of an inch on the full diameter, will be found sufficient; but in drilling soft rock one-thirty-second of an inch and frequently more is necessary.

After the diamonds are all set, water grooves should be cut across the face of the bit and down the inside and outside to the counterbore and the shoulder. Be careful to make them ample, so that the drill cuttings can be easily carried away by the flow of water. If the water grooves are not made large enough, the metal of the bit is worn away from the diamonds, and the settings become loose and unsafe before they should.

The bit should be carefully examined each time the rods are pulled, and when the metal shows signs of wear it should be

carefully caulked back around the diamonds. This examination sometimes shows that the diamonds do not "cover" the cutting face properly; in such cases it is best to set in a small stone to reinforce the setting for the time being, and when the diamonds are cut out and reset, be careful to see that they "cover".

To cut the stones out after the bit has become worn so that the settings have become unsafe, take a hack saw or file, cut across the face of the bit close to the stone, drive the metal away from it, and chip it away until the stone is released.

The TOOLS necessary for diamond setting are one set of the small chisels and caulking tools, a light hammer, a bit holder (in which to hold the bit blank), a small vise and one or two files. They are always furnished with our large Diamond Drill outfits.

The following rules, with cut, for the proper working of the two hand drills in the Government's possession, are borrowed from a leaflet issued by the Bullock Company :

The "Bravo" Drill.

The frame proper of the "Bravo" Drill, A, has trunnions BB, which turn and are secured in hinged bearings CC. These bearings are adjustable upon the columns DD. The columns are secured to the wooden foundation frame E by means of swivelling pedestals, FF, thus allowing the drill to be placed at the height and angle desired.

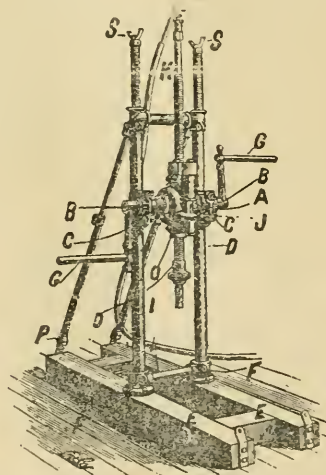
Through the trunnion B B, driving shafts pass, to which handles GG are attached.

METHOD OF OPERATING.

After setting the frame in position, as shown in cut, place the feed shifter J in the middle position, hold the feed nut O below the frame by the spanner wrench. By means of the handles turn the feed screw left handed, thus running it up until the chuck I just clears the feed nut O. Insert a length of drill rod K; to upper end attach the water swivel L; to lower end the core barrel core lifter and bit. Extend the drill rod through the feed screw

until the bit nearly touches the rock; secure the drill rod by means of the nuts on the chuck. Move the feed shifter to either its upper or lower position (upper for slow and lower for fast feed), start the water through the connections to the water swivel, and see if it flows out freely at face of bit. Turn the feed screw right handed by means of the handles, and the bit will feed forward.

When a full run is made, i. e., the top end of the feed screw reaches the top of the drill frame, loosen the chuck nuts, move the shifter J to central position, turn the feed screw left handed, and



The "Bravo" Drill.

the feed screw will run back as before. After securing the rods by the chuck, and moving the shifter J to upper or lower position, while the feed screw is turned right handed, the bit will again feed forward.

When it is desired to take the core barrel and bit out of the hole (always when the distance drilled equals the length of the core barrel in use), allow the pump to work until all sediment or cuttings are removed from the hole. Attach the hoisting rope to the top of the water swivel, hoist the rods up so that a joint

will be above the safety clamp ; secure the rods by means of the safety clamp, and unscrew the length of drill rods above the clamp, and hoist them out of the feed screw. The drill frame proper can now be removed from the columns ; screw the hoisting plug into the top of the length in the safety clamp, attach rope, tighten up the rope and loosen the safety clamp, when length of rods can be taken up, depending upon the height of derrick used, a joint being a few inches above the clamp. Secure the clamp, unscrew and remove this length, and proceed in like manner until all rods are removed, including the core barrel and bit. Unscrew the core lifter from the core barrel, and the core will slip out of the core barrel. After securing the core, attach the parts in their relative positions again, and insert into the hole. Before removing the rods they should be marked, so that in letting them back into the hole the bit does not strike the bottom, but is held by the safety clamp at a short distance therefrom. Start the water through the boring tools so as to have a free flow before resuming drilling.

The foregoing is a general description of the drill and the method of operating.

It will be seen that it is also adapted for under-ground work in mines, &c. The back legs P and the wooden E are removed ; a short piece of plank set on the bottom for the pedestals F to stand upon ; also a piece at the roof for the crow feet of the extension screws S to rest against. By forcibly extending these screws the columns are held rigidly in position.

The drill is adapted for applying horse, electric or steam power, by removing the handles G and placing a driving pulley on one of the shafts. The size of said pulley to be determined by the driving pulley to the power, the driver on the drill running from 250 to 350 revolutions per minute.

Power can also be attached to the pump, either direct from the horse or other power, or from the other driving shaft of the drill by placing a pulley thereon, the pump to make from 50 to 75 revolutions per minute.

***Calyx Drills.**

THE CUTTER.

This tool, strictly speaking, does not cut the rock, but chips it with the action of a mason's chisel. The teeth should be alternately set for inside and outside clearance, and should be very carefully sharpened, set and tempered; unless this is done the result will often be unsatisfactory. Improper settings will not allow a sufficient space for the water, and a poor tempering often causes the teeth to strip. Likewise the vents and teeth should be carefully cut at the correct angle when sharpening.

It should not be rotated at more than about 10 revolutions per minute, and requires more water than the shot bits. These latter may be run from 100 to 200 revolutions per minute, and care must be taken in not wasting the shot by washing it either into the chip cup or out with the sludge at the mouth of bore-hole. This sludge should be carefully watched for change in colour or other characteristics denoting a change in the material bored. Inattention to this detail may often cause the loss of the whole object of boring, particularly in the case of such friable material as coal.

Where the hole is liable to cave, or where any part of the equipment is endangered through its condition, the drill-man should insist on the hole being cased. Especial care is necessary in setting up the derricks accompanying these drills, for if improperly set, the speed of drilling, verticality of hole, and even safety of the equipment, are often jeopardized.

Itinerary of Drills.

The following table of the dates and locations of the different drills since their purchase may be found useful for reference :—

No. and Description of Drill.	Locality of Boring.	Mineral bored for.	Dates of Use.
No. 1. ("Calyx" steam) 1500 feet.	Nictaux, Annapolis Co. Kennetcook, Hants Co. River Inhabitants, Rich. Co. Glendale, Richmond Co. Port Hood, Inverness Co.	Iron. Coal. " "	Oct., 1900, to June 1901. Aug., 1901, to Dec., 1901. Mar., 1902, to Sept., 1902. Sept., 1902, to Oct., 1902. Oct., 1902, to Nov., 1903.
No. 2. ("Diamond" steam) 850 feet.	Pottles' Lake and Ferris Lake Cape Breton Co. Drummond, Coll'y Pictou Co. Foxbrook Road, do Stanley, Hants Co.	Coa " " "	Nov., 1900, to Oct., 1901. Nov., 1901, to Nov., 1902. Nov., 1902, to Sept., 1903. Sept. 1903, to Mch., 1904.
No. 3. ("Diamond" hand.) 400 feet.	Whycocomagh, Inverness Co. Bridgeport Basin, C. B. Co. Mira Road, Cape Breton Co. Polson's Brook, Antig. Co. Pleasant Valley, Antig. Co.	Iron. Coal. " Iron. Coal.	1901, to Oct., 1901. Nov., 1901, to Nov., 1902. " July, 1903, to Oct., 1903. Oct., 1903, to Dec., 1903.
No. 4. ("Diamond" hand.)	Musquodoboit Valley, Hx. Co. Stewiacke Valley, Hx. Co. South Maitland, Hants, Co. Lake Ainslie, Inv. Co. Boularderie Island, C. B. Co. Glendale, Inv. Co.	Coal " " Iron. Coal. "	1901, to Mar., 1902. Mar., 1902, to Oct., 1902. Oct., 1902, to Feb., 1903. Feb., 1903, to May 1903. May, 1903, to Oct., 1903. Oct., 1903, to Dec., 1903.
No. 5. "Calyx steam" 1500 feet.	Hantsport, Hants Co. Apple River, Cumb. Co.	Coal. "	Sept. 1901, to Aug., 1903. Sept., 1903, to
No. 6. ("Calyx steam")	New Glasgow, Pictou Co.	Coal.	Sept., 1902.
No. 7. "Calyx steam" 350 feet.	Broad Cove, Inv. Co. Port Hood, Inv. Co. Barra Head, Rich. Co.	Coal. " Limestone	Mar., 1902, to June 1903. July, 1903, to Sept., 1903. Oct. 1903 to Dec., 1903.

Table showing the work of the various Drills since their purchase.

No. of Drill.	No. of holes bored.	Total No. of feet bored.	Deepest bored in feet.	Average depth of holes in ft.	Location of deepest hole.
1	15	7374	1020	491	River Inhabitants, Rich. Co.
2	8	3757	804	469	Pottles Lake, C. B. Co.
3	11	520	160	48	Musquodoboit, Hx. Co.
4	8	1440	445	180	Middle Stewiacke, Col. Co
5	2	2046	1496	1023	Hantsport, Hants Co.
6	1	565	565	565	Trenton, Pictou Co.
7	9	725	285	80	Port Hood, Inv. Co.
<hr/>					
	36	16074	1496	446	

Notes on Cost of Drilling.

Since the three Diamond drills were purchased by this Department, 88 carbons, weighing about 140 carats, were bought at a cost of \$8003.27, or an average cost of \$57.16 per carat. Now, as 5980 feet altogether have been bored with these drills, and assuming that 15 carats of carbon are still on hand, then the average cost per foot to date would be about \$1.24. The average cost, however, of late has been less than this amount.

The average cost of boring with these drills outside the wear of carbons is say \$1.00 per foot. Therefore, the total cost would be on the average about \$1.00 plus the average cost of carbons, (which as shown below is \$1.24 per foot, equals \$2.24 per foot.)

The average cost of drilling with the Calyx drills is shown to be about \$1.60 per foot. Assuming then the average speed of boring to be about equal with the two classes of drills, and taking into

account the larger cores got with the latter type, the advantage would apparently lie with them.

In the table following, however, the expenses incurred in moving, housing, by periods of vexatious delay often found unavoidable, and other miscellaneous expenses, have not been included, and probably would add more in the case of the Calyx than with the Diamond drills.

In boring the deep hole at Hantsport the total cost was said to be \$3.00 per foot. This was bored with No. 5 drill.

On pages 80, 81, 82 and 83 of Catalogue No. 49 published by the Sullivan Machinery Company, are given among other items the average cost per foot of carbon wear in certain drilling operations. The first two instances are from borings by the Ontario Government, and in two sets of holes the carbon cost if computed at recent prices would be \$0.65 and \$4.73 per ft. respectively. This is for an aggregate depth of 2922 feet. Thereafter in the same article are given instances of Diamond drilling at several points in the United States, and basing their calculations on the same prices as above, the average cost for carbon wear per foot for some 36,368 feet of drilling would be \$1.08 per foot.

The carbon cost on the opposite page (\$1.24 per foot) may appear high, though in comparison with the above, it does not seem *very* excessive.

However, it should be particularly noted that this figure is an *actual average* for the work done up to that date and was published as a guide to probable operators in making up their estimates for proposed work.

If reference will be made to my memorandum on the past year's work in the Nova Scotia Mines Report, it will be seen that this figure has been greatly reduced and the average carbon cost per foot was 12 cents for 1761 feet bored during the year.

D. W.

Table showing rates and cost of drilling from records supplied by the drill runners.

No. of Drill.	Depth of hole in feet.	Nature of Rock.	Average rate of drilling, feet	Labour.	Management.	Fuel.	Oil, Waste, Licks, etc.	Shot and Gravel or Carbons.	Total cost.	Cost per foot	Remarks.
1	620	Hard Slates and quartzites impregnated with Iron ore.	.5	\$ 670 00	\$250 00	\$165 00	\$35 00	\$ 50 00	\$1200 00	\$1 93	
1	1020	Shales and Sandstones.	1.7	1217 00	459 00	63 00	15 00	67 50	1822 50	1 77	
1	520	"	3.1	356 16	72 00	26 00	3 80	18 00	484 96	93	
1	844	"		1013 45	372 15	64 50	12 88	70 00	1532 00	1 81	
1	735	"		726 00	240 75	60 00	16 50	56 99	1124 24	1 49	
1	805	"		1067 00	335 00	105 00	7 69	52 00	1566 76	1 94	
1	582	"		499 00	159 06	90 00	*56 40		804 00	1 38	
2	490	"		109 00	304 70	27 50	3 39	+612 05	1036 86	2 16	
4	445	"		169 50	234 42	58 00	6 00	542 00	1010 72	2 27	
7	This drill bored several holes, the deepest being 285 feet and costing from 71 cents to \$2 per foot.										

*Includes shot and gravel.

†Averaging carbons at \$1.25 per foot.

A list of bore-holes put down in various parts of the Province and at various times since 1866 is attached.

It is not presumed that this is a *complete list* of all the bore-holes drilled in the Province ; but with the facilities and references at hand and in the comparatively short time allowed, it has been made as full as possible, and it is hoped that it may prove useful as a reference.

For valuable assistance in compiling this list, I have to particularly thank Messrs Fletcher and Poole, as well as several others who have given what data they had at hand.

Several holes have been put down at the various collieries for mechanical purposes, but I believe in only a few of these cases have any records of the strata been kept.

Wherever possible the geological records afforded by shafts and cross-cuts should be carefully preserved, as they are generally more valuable than bore-holes.

No. of bore-hole.	Date of boring.	Object of boring.	Location of Bore-hole.	Depth attained in ft.	For Particulars refer to	Remarks
1	1886	Salt	Antigonish.	650	Geol. Survey, 1886, p. 124	Harper's Bore-hole.
2	1871-2	Coal	Springhill.	388	" " 1899, p. 167	" "
3	1873	"	"	176	"	Probert's
4	1873-4	"	"		"	"
5	"	"	Joggins.		1875-76, p. 345	
6	"	"	Pictou.	677	1875-76, p. 346	
7	"	"	"	715	1890-91, p. 123	
8	1874	"	Mapleton.		1889, p. 167	
9	"	"	Miller's Corner.	320	1902, p. 394	
10	"	"	Rodney.	136	1902, p. 394	
11	"	"	Sutherland's Pt.		"	
12	1874-82	Oil	East River, Pictou Co.	734	1890-9 p. 109 P.	
13	"	"	Lake Ainslie	650	1886, p. 114 P.	
14	"	"	"	900	1890-1, p. 38	
15	1875-76	Coa	Joggins.	1100	1883-4, pp. 43 & 44	
16	"	"	"	1026	1890-1,	
17	"	"	"	1045	"	
18	1875	"	Hardwood Hill.	700	1886, p. 114 P	
19	"	"	Caribon Isl., Pictou Co.	469	1890-91, p. 128 P	
20	"	"	"	463	" " p. 140 P	
21	"	"	Logan's Tannery	1000	" " " p. 139 P	
22	"	"	Lyon's Brook	500	" " " "	
23	"	"	"	500	" " " "	
24	"	"	Kemptown, Colchester Co.	137	1890-91, p. 170 P	
25	"	"	West River, Pictou Co.	280	" " p. 174 P	
26	"	"	Sylvester, Colchester Co.	400	" " p. 174 P	
27	"	"	Springhill, Cumb. Co.		1892, p. 43 A	
28	"	"	Abercrombie, Pictou Co.	350	1894, p. 94 A	

To Joggins Main Seam
Overlying " "

29	1875	Coal	New Campbellton, C. B. Co.	.....	.....	.....	.....
30	"	"	Petty Brook, Antig. Co.	.....	.....	.....	.....
31	"	"	Fox Brook, Pictou Co.	.....	.....	.....	.....
32	1878	"	Stellarton, Pictou Co.	1337	Geol. Survey 1895, p. 109 A.	.....	.....
33	"	"	"	1008	" " p. 110 A.	.....	.....
34	"	Oil	Stellarton, N. S.	280	Transactions N. S. Institute of	.....	.....
35	1880?	"	Baddeck River, C. B.	400?	Science, pages 305, 6, 318, 327.	.....	.....
36	1881	Water	Springhill	752	Geol. Survey, 1882-4 p. 9 H.	.....	.....
37	1882	"	"	602	" " not published	.....	.....
38	1882	"	"	402	" " "	.....	.....
39	1884?	Coal	Bonnars Head, C. B. Co.	.....	Mines Department.	.....	.....
40	1889	"	The Marsh, Pictou Co.	981	Trans. N. S. Inst. Science, Ser. 2, Vol. I, part 3, pp. 322-327.	.....	.....
41	1892	"	Maccan Station.	675	Geol. Survey, 1892, p. 43 A.	.....	.....
42	"	"	"	517	also	.....	.....
43	"	"	"	124	James Baird, Chignecto	.....	.....
44	"	"	"	500	and	.....	.....
45	"	"	"	504	Frank Burrows, Joggins.	.....	.....
46	"	"	"	655?	.....	.....	.....
47	"	"	"	73	.....	.....	.....
48	1894	Ropew'y	Stellarton.	780	H. S. Poole, Esq., Halifax, N. S.	.....	.....
49	1896	Coal	Hines' Road.	400	Geol. Survey, 1896, p. 95. A.	.....	.....
50	1897	"	Cochrane Lake.	67	" " 1897, p. 102 A.	.....	.....
51	"	"	"	60	" " "	.....	.....
52	"	Oil	Lake Ainslie.	.....	" " "	.....	.....
53	1898	Coal	Springhill.	48	" " 1898, p. 142.	.....	.....
54	1899	"	"	146	" " 1899, p. 164.	.....	.....
55	1900	"	Mapleton, Camb. Co.	30?	" " 1900, p. 162 A.	.....	.....
56	"	Iron	Torbrook, Annapolis Co.	60	Trans. N. S. Inst. Sc., Vol. 10.	.....	Gov't Drill No. 1.
57	"	"	"	201	Ser. 1900-I, " "	.....	" "
58	"	"	"	330	" " "	.....	" "
59	"	Coal	Pottles Lake, C. B.	804	N. S. Mines Department.	.....	" No. 2.

No. of bore-hole.	Date of Boring.	Object of boring	Location of bore-hole.	Depth attained in feet.	For particulars refer to:	Remarks.
60	1900	Coal	Ferris' Lake, C. B.	706	N. S. Mines Dept.	Govt. Drill No. 2
61	"	"	Little Bras d'Or.	501	"	"
62	1901	Iron	Torbrook, Annapolis Co.	620	Trans. N. S. Inst. Sec., Vol. 10, Ser. 1900-1.	" " 1
63	"	"	Torbrook, Annapolis Co.	192	"	" " 1
64	"	Coal	Upper Kennetcook Hts. Co	132	N. S. Mines Department.	" " 1
65	"	"	"	250	"	" " 1
66	"	Iron	Whyecomagh.	70	Mon. Robt. Drummond, Stellarton	" " 3
67	"	Coal	Grand Lake, C. B.	750	Geol. Survey, 1901 p. 209 A.	" " 3
68	"	"	Lingan, C. B.	29	Mines Dept. N. S.	" " 3
69	"	"	"	52	"	" " 3
70	"	"	Lynx Lake, C. B.		Geol. Survey.	" " 4
71	"	"	Musquotoit.	56	Mines Department, N. S.	
72	"	"	Leamington.	1082	Geol. Survey 1901, p. 214. A.	
73	"	"	"	205	"	
74	"	"	"	250	"	
75	"	"	Drummond Colliery.	100	"	" " 2
76	"	"	"	346	"	" " 1
77	1902	"	Coal Brook, Richmond Co.	520	"	" " 1
78	"	"	"	1020	"	" " 1
79	"	"	Glendale, Inverness Co.	520	"	" " 4
80	"	"	Middle Stewiacke.	445	"	" " 4
81	"	"	"	145	"	" " 4
82	"	"	"	130	"	" " 4
83	"	"	Riverton, Pictou Co.	565	"	" " 6
84	"	"	Cochran Lake, C. B.	300	"	
85	"	"	1½ miles N. E. of Trenton	660	I. McNaughton, Eureka, Pictou Co. N.S.	
86	"	"	Mapleton, Cumb. Co.	70	Geol. Survey, 1903, p. 394	

87	1902	Oil	Lake Ainslie, C. B.	3260	Geol. Survey, 1902, p. 392 A.	Churn Drill.
88	"	"	Skye Glen, C. B.	1100	"	"
89	"	Limest'o	George's River, C. B.	299	W. F. Jennison, M. E., Sydney, C. B.	Horiz'l hole through the mountain.
90	1903	Oil	Cheverie, Hants Co.	1910	Jno. Longard, Hfx., Geol. Sur., 1903, p. 391	Gov't drill No. 2.
91	"	"	Foxbrook Road, Pictou Co.	620	Mines Department, N. S.	"
92	"	Coal	Stanley, Hants Co.	490	"	"
93	"	"	"	190	"	"
94	"	"	Hantsport.	1496	"	No. 5.
95	"	"	Port Hood, Inverness Co.	344	"	No. 4.
96	"	"	"	735	"	"
97	"	"	"	805	"	"
98	"	"	"	582	"	"
99	"	"	Polson's Brook, Antig. Co.	75	"	Gov't drill, No. 3.
100	"	"	Pleasant Valley, "	85	"	This depth in holes
101	"	"	510 ft. east borehole No. 84.	875	Isaac McNaughton, Eureka, Pictou, Co. N.S.	"
102	"	"	Maitland, Hants Co.	60	Mines Department, N. S.	Gov't drill No. 4.
103	"	"	Glendale, Inverness Co.	46	"	"
104	"	"	Broad Cove, "	68	"	"
105	"	"	"	29	"	"
106	"	"	"	61	"	No. 7.
107	"	"	"	38	"	"
108	"	"	"	72	"	"
109	"	"	Port Hood, Inverness Co.	285	"	"
110	"	Limest'o	Barra Head, Richmond Co.	49	"	"
111	"	"	"	50	"	"
112	"	"	"	75	"	"
113	"	"	"	45	"	"
114	1904	"	"	14	"	"
115	"	Coal	Riverton, Pictou Co.	1900	Chas. Fergie.	Ch'n drill, still boring
116	"	"	Cumberland Co.	1200	"	"
117	"	"	Apple River, Co.	600	Mines Department, N. S.	Gov't drill No. 5, still boring.
118	"	Water	Riverton, Pictou Co.	377	John R. McKay, Stellarton.	"

The following list supplied by Mr. G. H. Duggan of the Dominion Coal Company, is without dates, but have been put down within the past few years:—

No. of bore-hole.	Object of boring.	Location of bore-hole.	Depth attained in feet	For particulars refer to:	Remarks.
119	To determine exact distance between Phelan and Emery Seams.	Centre of old furnace shaft at Caledonia on Phelan seam.	164	Dominion Coal Company's Office.	492 feet with a churn drill, balance with Calyx. Emery occurs between 537' 7" and 541' 11" = 4' 4" of coal.
120	To determine thickness of Emery Seam.	Near Locomotive shed, Glace Bay.	544	Dominion Coal Company's Office.	Emery Seam occurs between 313 and 317 feet—4' of coal.
121	" " "	2600 feet from the crop of Emery Seam and on production of line of No. 14 Slope.	317		



